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INITIAL SELECTION OF CANDIDATES FOR  
**PILOT, BOMBARDIER  
AND NAVIGATOR  
TRAINING**

DO NOT LOAN



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BY *Alfred L. L. ASAR*  
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PREPARED BY  
ASSISTANT CHIEF OF AIR STAFF  
**INTELLIGENCE**  
HISTORICAL DIVISION

The original of this monograph and the documents from which it was written are in the USAF Historical Division, Archives Branch, Bldg. 914, Maxwell Air Force Base, Alabama.

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Army Air Forces Historical Studies: No. 2

101-2 Nov 1943	RETURN TO:
Director Aerospace Studies Inst. ATTN: Archives Branch Maxwell AFB, Alabama	

Initial Selection of Candidates  
For Pilot, Bombardier, and Navigator Training

Prepared by  
Assistant Chief of Air Staff, Intelligence  
Historical Division  
November, 1943

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FOREWORD

It is the desire of the President, the Secretary of War, and the Commanding General, Army Air Forces, that a solid record of the experiences of the AAF be compiled. This is one of a series of studies prepared as a "first narrative" in the projected overall history of the Army Air Forces.

The decision to make the information contained herein available for staff and operational use without delay has prevented recourse to some primary sources. Readers familiar with this subject matter are invited to contribute additional facts, interpretations, and constructive suggestions.

This study will be handled in strict compliance with AR 380-5.




THOMAS D. WHITE  
Brigadier General, U. S. Army  
Assistant Chief of Air Staff,  
Intelligence

Constructive criticisms and additional facts and interpretations are requested. To that end perforated sheets, properly addressed, are included in the appendix.





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MEMORANDUM FOR THE COMMANDING GENERAL, ARMY AIR FORCES: (Office of the  
Assistant Chief of Air Staff, Intelligence; Attention: Chief, Historical Division)


Subject: Critique of "Initial Selection of Candidates For Pilot, Bombardier,  
and Navigator Training"

  
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A number of psychological tests were developed and tried out with a view to determining adaptability for flying. One series of tests was employed to determine the ability of cadets to withstand the effects of high altitudes. Oxygen insufficiency was produced by the Henderson rebreathing apparatus, and the important resulting effects on attention and on voluntary sensory-motor coordination were made the basis of practical tests for rating aviators. Other tests developed for discovering special aptitude for flying included the judgment of differing rates of motion which intersect, pursuit movements of the hand, the power to trace and retrace a given course, the strength and maintenance of a maximal grip, and the time of complex reaction to visual signals.<sup>6</sup>

From August 4, 1918, Edward L. Thorndike served as chairman of the subcommittee on aviation of the Committee on Classification of Personnel in the Army. The Division of Military Aeronautics had requested that he be designated to prepare and put into operation methods of psychological testing appropriate for examining the personnel of that division. For this purpose he studied the system used by the aviation examining boards in the selection of candidates for the Air Service and also the intelligence tests in general use in the Army. He then developed a test to measure mental ability requisite for success in the Air Service.

The Thorndike test of mental alertness, as it was called, was composed of eight of the standard Army tests already in use by the Division of Psychology in the Office of the Surgeon General, plus five others. The standard Army tests were modified by being made harder so as to be suitable for selecting officer material rather than enlisted men. Fifteen forms of the test, of equal difficulty, were prepared so that a new form could be given every two weeks, thus preventing any unfair preparation for the test. Finally, the tests were so arranged that they could be given by the examining boards or by any personnel officer after an hour's study of the directions.<sup>7</sup>

The tests were tried out with five hundred cadets and the correlations and partial correlations determined. The test was shown to give a much better prediction of success in the ground school than statements of education, class standing, or any other item reported by the candidate. A prophecy was made concerning fifty men tested on their third day in the Princeton Ground School. Eight men were named as likely to do poor work; of these eight, six were subsequently discharged from the school. Of eleven men named in a similar prediction at the Ohio School, only two graduated without being "set back," while six failed to graduate.<sup>8</sup>

The test was adopted for use by all examining boards and remained in force until mobilization ceased. It was shown to be useful also in eliminating men who lacked the ability to learn to fly well enough to receive the RMA (Reserve Military Aviator) rating. Excerpts from the test are shown below:

#### TEST 2

Look at each sentence. Think what it would be if the words were put in the right order. If it would be true, draw a line under the word true. If it would be false, draw a line under the word false.

1. health necessary camp a is to clean . . . . . true false
2. Germany of Wilson King is England and. . . . . true false
6. tropics is in the produced rubber . . . . . true false

- 
6. Ibid.; History of the Personnel System (developed by the Committee on Classification of Personnel in the Army), Vol. I in The Personnel System of the United States Army, 2 vols., 617-28.
  7. Aviation Psychology Abstract No. 54; History of the Personnel System, 614.
  8. History of the Personnel System, 614-15.

4

## TEST 4

Write the correct answers to these problems. Use the margins of the pages to figure on.

3. A recruit spent one-eighth of his spare change for post cards and four times as much for a box of letter paper, and then had 90 cents left. How much money did he have at first? . . . . . Answer ( )
7. A U-boat makes 8 miles an hour under water and 15 miles on the surface. How long will it take to cross a 100-mile channel, if it has to go two-fifths of the way under water? . . . . . Answer ( )
10. A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the rest of its stock to 29 mess halls. Each mess hall received 54 barrels. What was the total number of barrels supplied? . . . . . Answer ( )

## TEST 5

In each of the sentences below, you have a choice among four words. Draw a line under the one of these four words which makes the truest sentence.

4. The howitzer is a type of machine-gun rifle cannon pistol.
5. The Zeppelin is a monoplane biplane dirigible submarine.
7. From Berlin to Petrograd is about 500 mi. 900 mi. 1,400 mi. 1,900 mi.<sup>9</sup>

From a study of the records of over two thousand fliers, Thorndike also determined the relationship between actual success as a military aviator and such factors as age, social status, intellectual ability, business achievement, and athletic ability. On the basis of his own research and that of others, he prepared a testing and rating plan as part of a general plan for the selection and classification of officer material in the Students' Army Training Corps, and it was adopted by the procurement branch of the Personnel Section of the Air Service. The plan was to have been put into operation in November 1918 for the selection of over one thousand aviation cadets per month from the Students' Training Corps, had not the war come to a close.<sup>10</sup>

Paralleling the work of the psychologists in developing written and psychomotor tests for measuring flying aptitude was that of the medical men in setting up physical and neuro-psychic qualifications for flying cadets. Shortly after the entry of the United States into the war sixty-seven trained examining units were put into operation in the larger cities.<sup>11</sup> The original physical examination for flying lacked proper balance. The form which was used in recording the results of the examination, W.D., A.G.O. Form No. 609, was three pages in length, and over half of the space was devoted to the eye and ear. The nervous system, on the other hand, was allotted but one line. The instructions which accompanied the examination form were devoted exclusively to the eye and ear except for the final paragraph.<sup>12</sup> Physical standards required for qualification as flying cadets were high. The principal requirements were as follows: visual acuity of 20/20 vision in each eye; hearing acuity of 20/20 for the whispered voice; minimum height of 60 inches with no maximum limit; and minimum weight 110 pounds and maximum 190 pounds. The remainder of the general physical examination was routine. The nervous system was believed to have been

9. Ibid., 615-17.

10. Ibid., 604-14, 617-31; Aviation Psychology Abstract No. 54.

11. TW 8-320, 219.

12. Armstrong, Principles and Practice of Aviation Medicine, 30-31.

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## Chapter I

DEVELOPMENT OF SELECTION AND CLASSIFICATION PROCEDURES,  
1917 - 1919

"Rome Blasted By Bombs"; "Cologne Raided Again"; "Tons of Bombs Rained on Japs at Munda." Such headlines are read with satisfaction, but few people realize the many months of planning that are required to put the planes and their crews into the air. The pilots who fly the planes, the navigators who chart the course, and the bombardiers who drop the bombs have all been carefully selected from among hundreds of eager applicants. By means of a series of screening tests, the relative mental, physical, neuropsychic, and psychomotor qualifications of the different men are determined, and only those able to meet the prescribed standards are accepted for training.

The methods of selection and classification of aircrew personnel employed by the Army Air Forces today are the result of an evolutionary process which dates back to the First World War. During the early part of that war, the Allies selected their pilots in a haphazard manner. Courage was considered the only trait essential to piloting an airplane. If an individual possessed that to a high degree, there was nothing to prevent him from flying. This method of selection proved to be unsatisfactory. The British during the first year of the war found that of every 100 aviators killed, 2 met death at the hands of the enemy, 8 because of defective planes, and the remaining 90 because of their own individual deficiencies. Of these 90 deaths, 60 were found to have been directly due to physical defects.<sup>1</sup>

After many terrible accidents with their toll of manpower and materiel, the Allies began to consider the problems connected with flying and to try to find some means for preventing this wastage. French, Italian, and British psychologists and medical men developed tests, gathered data, and carried on research with a view to discovering methods for measuring flying aptitude.<sup>2</sup>

When the United States entered the war in 1917, therefore, it was able to benefit from the experience of the Allies and from the work already done by them. In the summer of 1917 a Committee on Psychological Problems of Aviation, which had been authorized by the Council of the American Psychological Association, undertook the selection and development of mental and psychological tests which could be used to indicate aptitude for flying. Various existing forms of apparatus were adopted for the tests and several new forms were devised and constructed. Although the primary intention was to proceed empirically to determine which tests were indicative of flying ability, it was also proposed to undertake the development of tests bearing on the mental and physiological state of the aviator during flight.

The evaluation of the tests by trial on cadets at the Army Aviation Ground School, Massachusetts Institute of Technology, was begun early in June 1917. The following tests were given:

1. Patellar reflex with two stimuli in succession, a gradually decreasing interval between stimuli.
2. Electrical threshold.
3. Cardiograms and records of respiration while reclining and while "chinning" oneself.

- 
1. TM 8-320. Notes on Psychology and Personality Studies in Aviation Medicine, Jan. 27, 1941, pp. 218-19. Although these statistics have been repudiated verbally by British sources as inaccurate, they have been retained since no corrected figures were offered. Even though inaccurate they illustrate admirably the need for an effective system of selection in choosing candidates for pilot training.
  2. F.C. Dockeray and S. Isaacs, "Psychological Research in Aviation in Italy, France, England, and the American Expeditionary Forces," in Comparative Psychology, I (1921), 115-33; H. G. Armstrong, Principles and Practices of Aviation Medicine, 25-30.

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4. Finger movement; first and second fingers moving together as rapidly as possible through an uncontrolled distance.
5. Swaying; standing with a helmet beneath smoked paper.
6. Visual acuity; Ives gratings.
7. Memory Test (Dodge's); words exposed one letter at a time.
8. Inhibition of winking reflex.
9. Eye reactions to light; moving from fixation point to a spot of light which appears.
10. Speed of eye movements.
11. Ocular pursuit movements; following pendulum.
12. Reversed maze; tracing it visibly and then invisibly and rotated.
13. Association reaction with crucial words involving fear, falling, etc.
14. Motor learning; learning a fixed series of reactions with two alternatives by trial and error.
15. Auditory difference threshold with loud standard similar to the sound of a motor.
16. Distance and velocity estimation; moving target passes across opening at constant rate and then disappears; the subject tries to stop it when it has reached (invisibly) a given point.
17. Continuous choice reaction; each stimulus being produced by the preceding correct reaction.
18. Tapping with index finger vertically between two fixed contacts.
19. Equilibrium reaction time; subject sitting on platform which tilts suddenly; choice reaction to the direction of tilt.
20. Simple visual reaction time.
21. Simple auditory reaction time.
22. Fatigue; ergograph with middle finger.
23. Emotional stability; changes in pulse, breathing and arithmetical performance as affected by a revolver shot.<sup>3</sup>

About seventy-five cadets were given the above series of tests. Arrangements had been made to correlate test performances with records from the flying schools as soon as these men learned to fly solo, and also when they received the rank of Reserve Military Aviator. Unfortunately, developments in Europe interfered with the carrying out of this program. The exigencies of war made it necessary to send some of the men directly from the ground school to overseas duty and, as a result, records of flying ability were obtained for only twenty-five of the men tested.<sup>4</sup>

During the autumn of 1917, the Committee on Psychological Problems of Aviation was reorganized. Harold E. Burr, who had acted as chairman of the original committee, resigned, and George M. Stratton, who had been working independently on tests for aviators at Rockwell Field, San Diego, was appointed chairman. Edward L. Thorndike was chosen as executive secretary. W. R. Miles and L. T. Troland of the original committee continued their membership, while John B. Watson, Warner Brown, Francis Maxfield, and H. C. McComas were added.

A series of tests, properly weighted, had early appeared to be the most practical means of predicting aptitude for flying. Provision was made by the Army for a systematic and detailed tryout of promising tests at Rockwell and Kelly Fields in cooperation with the Committee on Classification of Personnel, which had been set up under the jurisdiction of The Adjutant General of the Army. The personnel of the group to whom the tests were given included one hundred men chosen on the basis of their special skill in flying, one hundred chosen as relatively inept at flying, and one hundred candidates of unknown ability. The work, carried on in the spring of 1918, resulted in provision by the War Department for further research and the authorization of four special examining units to apply the tests to candidates for cadetship.<sup>5</sup>

3. Robert M. Yerkes, "Report of the Psychology Committee of the National Research Council," in *Psychological Review*, XXVI (1919), 94-99; cf., "Psychological Problems of Aviation in World War I," in Aviation Psychology Abstract Series [prepared by Psychological Section, Research Division, Office of the Air Surgeon], Abstract No. 54, Nov. 4, 1942.

4. Aviation Psychology Abstract No. 54.

5. Ibid.

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adequately tested by the findings in the eye and ear examinations, a belief based on the assumption that the eye and ear tests had determined accurately and completely the functional integrity of the central nervous system.<sup>13</sup>

At the close of the World War a tabulation was made of the results of the physical examination which had been given to approximately 100,000 candidates for flying cadet training. It was found that 69.7 per cent had qualified while 30.3 per cent had been rejected. Causes for rejection are shown in Table I. The figures given here are somewhat misleading since the exact nature of the defects was not specified where a candidate had two or more defects. From studies of the statistics of the individual units it was found that where candidates failed on two or more counts, visual defects were present in at least half of the cases. In other words, 50 per cent of those rejected failed to meet the eye requirements.<sup>14</sup>

The work of the examining units and of several research units, which had been set up in 1917,<sup>15</sup> supplied much valuable information with respect to numerous medical problems connected with aviation and provided the basis for a greatly improved physical examination policy in the postwar period.

TABLE I

Disqualifying Physical Defects--  
Applicants for Training as Cadet Flyers--  
First World War, 1917-1918

	Per cent
Eye	6.9
Ear	1.2
Nose and throat	0.8
Equilibrium	2.0
Vascular system	1.5
Urinalysis	0.4
Other and general subnormalities	1.9
Disqualified on two tests	7.0
Disqualified on three or more tests	8.6
Total	30.3

Source: H. G. Armstrong, Principles and Practice of Aviation Medicine (Baltimore, 1939), 33.

13. Ibid., 31-32.

14. Ibid., 32-33.

15. TM 8-320, 219.

## Chapter II

## DEVELOPMENTS, 1919-1942

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With the termination of the war, appropriations for military purposes were drastically reduced and the nation's aviation program languished. On July 11, 1919, an act of Congress was approved establishing the grade of flying cadet for student pilots in the Air Service and providing that the total number of flying cadets should not at any time exceed 1,300.<sup>1</sup> The maximum was raised by Congressional action on June 4, 1920, to 2,500 flying cadets,<sup>2</sup> but appropriations were so limited that at no time down to the inauguration of the expansion program in 1939 did the Air Corps have as many as 700 cadets entering flying schools in any one year.<sup>3</sup>

Throughout the twenty-year period 1919-1938, the supply of men interested in aviation far exceeded the demand. Standards for the initial selection of pilots<sup>4</sup> were set at a high level and the training was rigorous. Only a small number of men were able to complete successfully the full year of flying training. In 1923 authority was given for the examination of 631 men who were applying for pilot training. Of this number, only 127 men, or 20 per cent, met the rigid entrance requirements. In the same year only forty-five of those who had entered in previous classes were graduated from the advanced course at Kelly Field.

In Table II is shown the number of applicants, 1923 to 1939 inclusive, who were authorized to appear for examination during each fiscal year; and the number of men who qualified, who entered school, and who graduated from the advanced course during each of these years.<sup>5</sup> From the beginning of 1923 to the end of 1938 about 37,000 applicants for aviation cadet training were given permission to appear for examination. Of this number approximately 8,000, or 22 per cent, were found to be qualified for pilot training. Of the 8,000 men who were accepted, a number failed to report for training, and less than half of those who did start preliminary training during this sixteen-year period were successful in completing both the primary and advanced flying course. The largest number of cadets graduated from Air Corps schools during any one year was 246 (1932). Of the 37,000 applicants who had been examined originally, only 10 per cent were graduated.<sup>6</sup> This group of highly selected and highly trained pilots provided a pitifully small nucleus from which to build the great air armada soon to be demanded by war needs.

1. 41 Stat. 109.

2. 41 Stat. 759.

3. Annual Report Data, 1925-1940, in Records of Aviation Cadet Branch, Military Personnel Division, AC/AS, Personnel (hereinafter cited as Records of Aviation Cadet Branch); Psychological Division, Office of the Air Surgeon, "The Aviation Cadet Qualifying Examination -- A Report on the Purpose, Development and Validation of Test AC-10-A" (Oct. 1942), 2 (hereinafter cited as "Report on Aviation Cadet Qualifying Examination").

4. The only course offered flying cadets prior to July 1940 was that in pilot training.

5. "Report on Aviation Cadet Qualifying Examination," Table I, 2.

6. Id.

[REDACTED]

TABLE II

## SUMMARY OF THE PILOT SELECTION AND TRAINING PROGRAM

Fiscal Years 1923 to 1939 Inclusive

Fiscal Year	Number of Applicants Approved for Examination*	Applicants Qualified for Aviation Cadet Training	Cadets Entering Flying Schools	Cadets Graduating From Advanced Schools	Total Graduates: Cadets and Officers Combined
1923	631	127	124	45	78
1924	915	229	220	34	73
1925	1,057	287	234	53	131
1926	1,550	435	287	36	114
1927	1,640	349	342	38	111
1928	4,010	682	624	67	156
1929	4,095	807	564	220	275
1930	3,738	962	611	226	306
1931	2,081	504	637	195	250
1932	2,609	552	513	246	299
1933	2,624	503	454	225	287
1934	1,587	321	359	164	216
1935	1,735	251	324	146	204
1936	1,764	269	288	130	180
1937	2,166	427	360	120	170
1938	4,807	1,418	689	192	246
1939	8,146	1,722	903	397	479

\* These figures are for men applying for Aviation Cadet training only, exclusive of officers or enlisted men applying for training in grade. These data were compiled from records of the Aviation Cadet Section, Office of the Director of Personnel, Headquarters, Army Air Forces; and Statistical Records Section, Headquarters, Flying Training Command. ("The Aviation Cadet Qualifying Examination--A Report of the Purpose, Development and Validation of Test AC-10-A," prepared by the Psychological Division, Office of the Air Surgeon, October 1942, p. 2.)

A summary of the methods used in the initial selection of the 8,000 men chosen for pilot training prior to the inauguration of the expansion program in 1939 will supply the background for a better understanding of the Army Air Forces' wartime selection problem. The purpose of initial procedures of selection has always been to pick for training those men who possess the special aptitudes and qualifications required by military aviation and in this way reduce the number of men who are eliminated after training is begun. Selection procedures used prior to 1939 when only a few hundred pilots were being trained each year were quite different from the procedures which had to be adopted when the Army Air Forces program called for the training of thousands of pilots in the shortest possible time.

## Educational Requirements, 1919-1942

While the general qualifications for flying cadets varied slightly from time to time during the twenties and thirties, there were no changes of major significance, with the exception of the educational requirements which underwent several important modifications. In 1920 it had been decided that high school graduation or an equivalent amount of education would be required of every applicant for aviation cadet training. Examining boards were authorized to apply practical tests or oral examinations in order to determine whether the applicants met educational requirements. Written examinations of the essay or discussion type, covering

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the high school subjects, were commonly used for this purpose.<sup>7</sup> By 1925 two scheduled examinations were held each year for the purpose of qualifying applicants who could not submit evidence of graduation from high school or attendance at college within the one-year period preceding the date of examination.<sup>8</sup>

As a result of the popular impetus given aviation by the early transoceanic flights and other favorable publicity, it was possible to raise the educational requirements in 1927 so that only those men with two years of college training or its equivalent were qualified.<sup>9</sup> Applicants who had not completed two years of college could still qualify, however, by passing a special examination on nine college subjects--English grammar and composition, United States history, general history, geography, arithmetic, higher algebra, geometry, trigonometry, and elementary physics. Each subject was graded upon a basis of 100 per cent, and the final grade was the average grade received in the combined subjects. The passing grade was 70. The first special examination of this nature was held in August 1927.<sup>10</sup>

Excerpts from this examination are given below:

#### English Grammar

1. Classify in parallel columns the following pronouns as personal, demonstrative, relative, and indefinite: this, each, who, that, what, any, she, all, we, himself, whatever, those, their, who, it.
2. Write five sentences containing the following (underline each required phrase or clause):
  - (a) an adjective clause
  - (b) a noun clause
  - (c) an adverb clause
  - (d) a noun phrase
  - (e) a verb phrase
7. Parse the underlined words in the following sentence:

That man is truly happy who has solved the question of how he begins, and not of how he ends, of what he wants and not of what he has.

#### English Composition and English Literature

1. Write a theme of about 500 words on a subject chosen by yourself.
3. Make a list of the principal American authors of the nineteenth century and state in what field each excelled (whether as poet, dramatist, historian, etc.). Give at least 12 names.
4. Make a list of the principal English authors of the nineteenth century and name one work of each.

7. AR 615-180, Oct. 12, 1921; Office of the Director of Air Service, Special Regulations No. III, "Appointment of Flying Cadets to Air Service Schools" (1920).

8. Records of Aviation Cadet Branch.

9. AR 615-180, Dec. 31, 1927; memo for General Mason M. Patrick by Assistant Secretary of War, Nov. 24, 1926, in files of Aviation Cadet Branch; memo for Chief, Personnel Division, OCAC, by Enlisted Section, Personnel Division, Dec. 7, 1926, in ibid.; memo for flying cadet candidates by Acting Chief, Personnel Division, OCAC, July 7, 1927, in ibid.

10. Questions for Educational Examinations for Appointment as Flying Cadets, Air Corps, Aug. 9, 1927, in files of Aviation Cadet Branch.

Algebra

1. (a) Simplify

$$\frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{x} - \frac{1}{y}} \div \frac{x^2 - xy - 2y^2}{x^2 + xy - 2y^2}$$

- (b) Solve

$$\sqrt{x+4} + \sqrt{2x-6} = \sqrt{7x+14}$$

(Test your results).

3. (a) Find the value of  $x^3 + x^2 - 4x + 5$  when  $x = 2 + \sqrt{5}$ .  
 (b) Find the fourth power of  $(1 + \sqrt{-1})$ .

Plane Geometry

2. Theorem: The perpendiculars from the vertices of a triangle to the opposite sides meet in a point.
3. Problem:  
 (a) To bisect a given angle.  
 (b) Upon a straight line to construct a segment of a circle which shall contain a given angle.
4. Problem:

To construct a common external tangent to two given non-intersecting circles.

History

1. What European countries made settlements in what is now the United States? Give date and place of settlements of each.
4. Answer any three of the following questions:  
 (a) Briefly describe early Egyptian civilization.  
 (b) For what were the following noted: Lycurgus; Solon; Hasdrubal; Xerxes; Socrates?  
 (c) Briefly describe the career of Alexander the Great.  
 (d) Tell of the founding of Constantinople.  
 (e) Briefly describe the career of Julius Caesar.
6. Answer any three of the following questions:  
 (a) Identify briefly: Raleigh, William Pitt, John Smith, Nelson, Lloyd George.  
 (b) Who was Sir Francis Drake?  
 (c) Discuss the causes and results of the English Civil War; state what part was played by Cromwell.  
 (d) How did England obtain India? Canada? Australia?  
 (e) Discuss briefly the causes of the Boer War.<sup>11</sup>

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While minor changes were made from time to time in the subjects covered and in the type of special examinations given, the two-year college requirement remained in effect from 1927 until January 1942 in spite of numerous attempts to lower it.<sup>12</sup>

Table III shows the results of the special educational examinations that were given in the fiscal years 1923 to 1941, inclusive, and in the first half of the fiscal year 1942. It will be noted that in the years preceding 1940 an average of 35 per cent of the men who took the tests obtained passing marks. The group who qualified for training by passing the special educational examinations, however, constituted only about 6 per cent of the total number assigned to training.<sup>13</sup>

TABLE III

## RESULTS OF THE SPECIAL EDUCATIONAL EXAMINATION FOR AVIATION CADETS

Fiscal Years 1923 to 1942

Fiscal Year	Number of Applicants	Number of Examinations Held	Number Passing Examinations	Per cent Passing
1923	17	1	5	29.4
1924	92	3	28	30.4
1925	105	2	15	14.3
1926	149	3	41	27.5
1927	116	1	25	21.6
1928*	363	3	5	1.4*
1929	246	3	24	9.8
1930	176	2	48	27.3
1931	119	2	14	11.8
1932	75	3	25	33.3
1933	57	3	24	42.1
1934	47	3	8	17.2
1935	35	3	11	31.4
1936	53	3	20	37.7
1937	83	3	12	14.5
1938	237	3	68	28.7
1939	332	3	157	47.3
1940	928	4	355	38.3
1941	9,272	4	2,478	26.7
First half of 1942	8,992	2	5,562	61.9

\* Educational requirements changed from 4 years of high school to 2 years of college.

These data were compiled from the records of the Aviation Cadet Section, Office of the Director of Personnel, Hq., AAF. ("The Aviation Cadet Qualifying Examination--A Report of the Purpose, Development and Validation of Test AC-10-A," October 1942, p.5.)

12. On January 15, 1942, the educational examination was supplanted by the Aviation Cadet Qualifying Examination. Ibid.; memo for Robert A. Lovett, Special Assistant to the Under Secretary of War, by General George H. Brett, April 4, 1941, in AAG 351.28, Applicants; cf., memo for General Henry H. Arnold by Chief, Personnel Division, OCAC, March 24, 1937, in files of Aviation Cadet Branch; Proceedings of Board of Officers, OCAC, Jan. 20, 1938, in Ibid.
13. Records of Aviation Cadet Branch.

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## General Requirements, 1939

With the exception of the changes in the educational qualifications, flying cadet requirements in 1939 were very similar to those which had obtained in the twenties. Candidates had to be unmarried male citizens of the United States who at the time of application had reached their twentieth but had not reached their twenty-seventh birthday.<sup>14</sup> Candidates were to be physically and mentally normal. They were warned that they would be required to pass a rigid physical examination, and they were advised to consult a physician before submitting their applications, to determine whether they were below the physical standards of normal individuals. Asthma, a history of hay fever, or other pronounced allergic reactions; a history of kidney stone or renal colic; and history of mastoidectomy, unless it could be shown that the operation was a simple drainage and that there were no residuals, were disqualifying. Excessive underweight or overweight and dental defects such as caries and loss of an excessive number of masticating or incisor teeth were also disqualifying.<sup>15</sup>

The applicant had to present a certified document from the office of the registrar of a recognized college or university showing that he had completed satisfactorily at least one half of the necessary credits leading to a degree which normally would require four years' work, or in lieu thereof, he could pass a written examination. The applicant was to be of excellent character and had to present evidence of this fact by submitting three letters of recommendation from reputable citizens who were not related to him and to whom the applicant was well known. Any applicant who had a military aeronautical rating as pilot of heavier-than-air aircraft or who had received a similar rating in the Navy, Marine Corps, or Coast Guard, and any applicant who had been eliminated from further training due to failure in flying training or who had completed satisfactorily the course in the Army, Navy, Marine Corps, or Coast Guard, was not eligible for appointment as a flying cadet.<sup>16</sup> White applicants only were accepted, no provisions having been made for colored Air Corps units in the Army.

The candidate for flying cadet appointment was required to sign an agreement to enlist for three years as a flying cadet and not to request release from flying training before completion of the prescribed courses, with the understanding that upon completion of the course of instruction--in 1939, about nine months--he would be discharged as a flying cadet. Cadets who for any reason were found not qualified to continue the training were to be discharged from the service without delay. Candidates had to agree also that upon successful completion of the course of instruction as flying cadets, they would, if their services were desired, serve for three years on active duty with the Regular Army Air Corps as Reserve officers, unless sooner relieved by competent authority. Flying cadets were to remain unmarried during the period of training as cadets.<sup>18</sup> An application blank filled out in triplicate and accompanied by an affidavit, three letters of recommendation, a birth certificate or other certified documentary evidence of date of birth, and evidence of educational qualifications were to be mailed directly to The Adjutant General by civilian applicants, while candidates from the Regular Army, National Guard, or Reserve Officers' Training Corps were to forward their applications to The Adjutant General through military channels.<sup>19</sup>

When an application was approved by the War Department, the candidate was notified to appear before the Flying Cadet Examining Board nearest to his address. These boards, which were appointed by the Corps Area commanders or other commanding officers authorized

14. In 1926 the upper age limit had been changed to twenty-eight years (AR 615-160, c. 5, June 19, 1926), but in 1927 it was restored to twenty-seven years (AR 615-160, Dec. 31, 1927).
15. Flying Cadets of the Army Air Corps (1939), prepared under the direction of AG, 10-11; AR 615-160, July 20, 1938.
16. Flying Cadets of the Army Air Corps (1939); AR 615-160, July 20, 1938.
17. AG to the Hon. W. H. Larrabee, House of Representatives, Dec. 21, 1939, in files of Aviation Cadet Branch.
18. AR 615-160, July 20, 1938; Flying Cadets of the Army Air Corps (1939).
19. Flying Cadets of the Army Air Corps (1939).

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by The Adjutant General, were located at practically all Regular Army Air Corps stations where there were flight surgeons and the special medical equipment required for the physical examination. The boards consisted of three experienced officers of the Regular Army, including at least one Air Corps officer and as many others as practicable, and one medical officer, the flight surgeon. In 1939 there were thirty-seven such boards scattered throughout the country.<sup>20</sup>

Unless the applicant had presented documentary evidence of having fulfilled the educational requirements, he was required to take an examination. Written essay-type educational examinations were scheduled for the second Tuesday in August, November, February, and May.<sup>21</sup>

#### The Physical Examination, 1939

While only a small percentage of flying cadet applicants met the educational qualifications by taking a written examination, all applicants were required to take the physical examination which was given by the flying cadet examining boards at such times as were practicable. This examination was designed to select physically normal applicants and eliminate those with defects or disease which might become aggravated by flying training or which might increase the hazard of such training.

The physical standard for flying, which was prescribed by AR 40-110, was higher than that for enlistment in the Regular Army, and the examination itself was somewhat different, particular attention being given to those factors and functions of greatest importance in flying.<sup>22</sup> The routine examination included a thorough general inspection of the entire body, noting the proportions and symmetry of the various parts of the body, the chest development, the condition and tone of the muscles, the general nutrition, the character of the skin, and the presence of any deformities or of signs of immaturity.<sup>23</sup> Candidates were required to meet prescribed standards of height, weight, and chest measurements as shown in Table IV.<sup>24</sup>

The mouth, nose, fauces, pharynx, larynx, trachea, oesophagus, neck, spine, abdomen, pelvis, and the genito-urinary system were examined by inspection and palpitation. The minimum dental requirement consisted of a total of six masticating teeth and of six incisor teeth, all of which were so opposed as to serve the purpose of incision and mastication. In general, physical defects which would disqualify for enlistment in the Regular Army also disqualified for flying training.<sup>25</sup>

In addition to the routine physical examination, candidates for appointment as flying cadets in 1939 had to meet the following physical and mental requirements: vision 20/20 bilateral without glasses; unimpaired ocular muscle balance; and unimpaired optical organism, anatomically and mechanically; good respiratory ventilation and vital capacity; hearing 20/20 bilateral; a stable equilibrium; a sound cardio-vascular system, nervous and organic; a well-formed, well-adjusted, and coordinated physique; and an integrated and stable central nervous system combined with a temperamental constitution suitable for military flying.<sup>26</sup>

20. IBIA; AR 615-160, July 20, 1938.

21. AR 615-160, July 20, 1938; Flying Cadets of the Army Air Corps (1939).

22. AR 40-110, Feb. 21, 1939; AR 40-105, May 29, 1923; AR 40-105, c. 4, Feb. 12, 1936.

23. AR 40-105, May 29, 1923; AR 40-105, c. 4, Feb. 12, 1936.

24. AR 40-105, c. 3, Nov. 15, 1932; AR 40-110, Feb. 21, 1939.

25. AR 40-105, May 29, 1923; AR 40-105, c. 4, Feb. 12, 1936.

26. AR 40-110, Feb. 21, 1939; Flying Cadets of the Army Air Corps (1939)

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TABLE IV  
STANDARDS OF HEIGHT, WEIGHT, AND CHEST MEASUREMENTS

Height in Inches	Weight according to age period				Chest measurement at expiration (inches)	
	20-25		26-30			
	Weight (pounds) Standard	Minimum	Weight (pounds) Standard	Minimum	Standard	Minimum
64	128	115	131	116	32 1/4	30 1/4
65	132	117	135	120	32 1/2	30 1/2
66	136	121	139	124	32 3/4	30 3/4
67	140	125	143	128	33	31
68	144	129	147	132	33 1/4	31 1/4
69	148	133	151	136	33 1/2	31 1/2
70	152	137	155	140	33 3/4	31 3/4
71	156	141	159	144	34	32
72	160	145	164	149	34 1/4	32 1/4
73	164	149	169	154	34 1/2	32 1/2
74	168	153	174	159	34 3/4	32 3/4
75	172	157	179	164	35	33
76	176	161	184	169	35 1/4	33 1/4
77	180	165	189	174	35 1/2	33 1/2
78	184	169	194	179	35 3/4	33 3/4

Sources: AR 40-105, c. 3, Nov. 15, 1932; AR 40-110, Feb. 21, 1939.

In order to determine whether a candidate could meet these rigid requirements, the flight surgeon administered a series of tests of a highly technical character. Central visual acuity at twenty feet was determined by use of the standard Snellen test charts. The candidate was also tested for accommodation at thirteen inches through the use of the standard Jaeger cards. The standard depth perception apparatus was used to measure the candidate's depth perception at six meters. Among the other eye tests used were the heterophoria test at six meters, the power of divergence test, the red lens test, the peripheral vision for form test, the power of accommodation test, the power of convergence test, and the central

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color vision test. For the administration of the color vision test the medical examiner made use of the Ishihara or American Optical Company books of pseudo-isochromatic plates. A candidate with normal color perception and mental alertness could easily read the plates. If he missed more than 25 per cent of them, he was considered unsafe for aircrew training and was disqualified. If he missed 25 per cent or less of the plates, he was given an adjunct test with the SAM (School of Aviation Medicine) lantern or with the Holmgren yarns.<sup>27</sup>

Another important test was the Schneider Index. This index was a numerical score derived from changes in the pulse rate and blood pressure caused by changes in posture and by exercise. The individual showing signs of vasomotor instability and poor adaptability for military aeronautics often obtained a repeatedly low score on the index. While a candidate was never disqualified on the index alone, an index persistently less than eight meant a poor pulse response to exercise and posture, and the medical examiner then attempted to determine the cause. The blood pressure of every candidate was carefully checked, and if it was found to be abnormal, or in case of doubt, the procedure was repeated for a sufficient number of days to enable the examiner to arrive at a definite conclusion. Blood pressure requirements for aircrew training were: systolic, 100 minimum, 134 maximum; diastolic, 89 maximum. An X-ray of the chest was used to test for tuberculosis. Still other tests were used where circumstances indicated their desirability. Since the physical examination for flying was reported on W.D., A.G.O. Form No. 64, it was frequently referred to as the "64" examination.<sup>28</sup>

The most difficult part of the entire examination, perhaps, was the detection of mental and nervous diseases. For this purpose the candidate was subjected to a psychiatric examination, upon the basis of which he was given a flying adaptability rating. From the flight surgeon's point of view, the Adaptability Rating for Military Aeronautics, or ARMA as it was called, gave him an opportunity: (1) to study the applicant's psychophysical organization in order to determine whether it was normal, and if not, to decide whether the deviation was sufficiently great to make flying unsafe, either temporarily or permanently; aspects especially considered were intelligence, emotions, psychomotor activity, somatic demands, and the condition of the nervous system; (2) to determine the applicant's manner of reacting to his environment, whether adequate or not, and whether it was likely to make for efficiency or inefficiency in flying; (3) to determine in so far as possible personality trends, potentialities, limitations, and the existence of any latent tendencies which under stress of flying might become manifest and make for inefficiency; (4) and finally, to classify the individual as either qualified or disqualified.<sup>29</sup>

The test was conducted in the form of an interview, during which the flight surgeon by means of skillful questioning of the candidate was able to obtain the desired information. The candidate was examined and scored on the following basis:

	Value	Score
1. Family history--biologic inheritance and setting; father; mother; siblings; adjustment difficulties; reaction of family toward flying.	5	-
2. Environment--rearing; location; age position; economic conditions; discipline; interest; principles; reaction; worth.	5	-
3. Morphology--physical factors in shaping personality development; birth traumas; stammering; illness; injury.	10	-
4. Intelligence--importance; educational career; adjustments; work life; learning; memory; imagination; attention; perception; comprehension; judgment; tact.	60	-

27. AR 40-IIU, Feb. 21, 1939; School of Aviation Medicine, Flight Surgeon's Handbook (2nd ed., April 30, 1943), 30-42.

28. Flight Surgeon's Handbook, 9-10, 17-18; AR 40-IIU, Feb. 21, 1939; WD, AGO Form No. 64 (Physical Examination for Flying).

29. TM 8-320, 266; AR 40-IIU, Feb. 21, 1939.

	Value	Score
5. Achievement--goal; drives; conflicts; accomplishments; self-evaluation; mental stability.	20	-
6. Psychomotor activity--general; efficiency and effectiveness; style; disposition of time.	20	-
7. Emotional content--general; change; breadth; strength; appropriateness; control and stability.	35	-
8. Somatic demands--general; nervous instability; emotional instability; sex life; alcohol, tobacco, drugs; valuation.	25	-
9. Sociality--sociability; urge to adapt; self-seeking tendencies; valuation.	15	-
10. Philosophy of life--principles by which an individual lives.	5	-
Total	200	30

A score of 160 was arbitrarily selected as passing. The flight surgeon's final conclusion was often arrived at only after much weighing of assets against liabilities, and it was the final general estimate of the individual which determined the rating.<sup>31</sup>

The shortcomings of the methods used in rating flying adaptability were well recognized. The case history technique and subjective estimates made by the examiner lacked much of the support of more objective methods.<sup>32</sup> A validation test was conducted by the School of Aviation Medicine from October 1931 to March 1933 to determine how trustworthy the Adaptability Rating for Military Aeronautics was in predicting success in basic flying training. Nine hundred flying cadet candidates were given the ARMA, and predictions were made regarding their probable success in aviation training. Of this group 444 (49 per cent) were graduated, while 456 (51 per cent) were eliminated from basic training for failure in flying. Of those who were graduated, 271 (61 per cent) had been adjudged as satisfactory on their flying adaptability ratings, and 173 (39 per cent) had been declared unsatisfactory. Of those eliminated 182 (40 per cent) had been found satisfactory on the flying adaptability rating, while the remaining 274 (60 per cent) had been rated as unsatisfactory. Thus, if candidates with unsatisfactory adaptability ratings had not been allowed to start training, 39 per cent of the group which ultimately graduated would have been lost. A further examination of the data shows that there was only a very slight positive relationship between the flying adaptability rating and success in aviation training. The small positive coefficients obtained from the data of four different flight surgeons indicate that, while the flying adaptability rating is related to success in aviation training in a general way, it is of questionable value in individual predictions.

These findings were released by the School of Aviation Medicine as Report No. 66, on July 14, 1942, with the recommendation that a further check on the validity of the ARMA be made. It was recommended that flying adaptability ratings should be made and signed, and the candidates should be allowed to proceed with flying training even though their ARMA might be unsatisfactory. At the conclusion of basic training it would be possible to compare predicted performance in aviation with actual accomplishment.<sup>33</sup> Such a project was inaugu-

30. TM 8-320, App. I, 309.

31. Ibid., 267; 2nd Indorsement (basic unknown), Office of the Flight Surgeon, Eastern Technical Training Command, to Chief, Aviation Cadet Branch, Sept. 21, 1943, in files of Aviation Cadet Branch.

32. TM 8-320, 266.

33. School of Aviation Medicine, Research Report No. 66, July 14, 1942, in files of Research Division, Office of the Air Surgeon.

rated in the summer of 1943 as part of a larger study, but results will not be available before the summer of 1944.<sup>34</sup>

Despite criticism of the ARMA as unscientific, many medical men regard it as an essential part of the flying examination since it measures qualities which neither the psychological nor the routine physical examination has covered.<sup>35</sup>

Table V presents a detailed analysis of the disqualifying physical defects of applicants for flying cadet training during the calendar year 1939.<sup>36</sup> The same general pattern is to be observed in succeeding years.<sup>37</sup> In 1939 a total of 15,104 physical defects were found on 8,067 applicants for flying cadet training who were disqualified.<sup>38</sup> Many of these applicants had two or more physical defects which were disqualifying. On the eyes alone 5,264 disqualifying conditions were noted, 1,842 of these being instances of substandard visual acuity. The next largest number of defects, 3,327, was found to be under the cardiovascular system, 129 being due to heart conditions, 1,516 to blood pressure, and the remaining 1,682 to neurocirculatory instability (Schneider Index). Unsatisfactory ratings on the flying adaptability test (ARMA) resulted in the rejection of 911 applicants.<sup>39</sup>

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- 34. Memo for Recruiting and Induction Section, AGO by AAG, June 21, 1943, in files of Research Division, Office of the Air Surgeon.
  - 35. J. H. Schroeder, "A Study of the Proposed Flying Adaptability Test (A.C.) in the Course of Physical Examination of Civilian Aviators," in Journal of Aviation Medicine, III (1932), 150-55; J. M. Murray, "Psychiatry in the Army Air Forces," in American Journal of Psychiatry, C (1943), 21-24; W. S. Jensen, Aviation Medicine (a lecture delivered at the Jewish Hospital, Philadelphia, Penna., April 29, 1943).
  - 36. Annual Report of the Surgeon General (1940), 268.
  - 37. Annual Report of the Surgeon General (1941), 257-59; Annual Report of the Office of the Air Surgeon (1942); ibid. (1943).
  - 38. Data regarding the total number of applicants examined, the number qualified, those qualified with waiver, and the number disqualified are given in Table VI.
  - 39. Annual Report of the Surgeon General (1940), 268-69.

TABLE V

## DISQUALIFYING PHYSICAL DEFECTS - APPLICANTS FOR FLYING CADET TRAINING

Calendar Year 1939

Causes of disqualification	Number of physical defects	Percentage of total number physical defects
1. Visual acuity	1,842	.122
2. Depth perception	442	.029
3. Esophoria	206	.014
4. Exophoria	75	.005
5. Hyperphoria	196	.013
6. Prism divergence	347	.023
7. Associated parallel movements	17	.001
8. Tangent curtain	4	.000
9. Diplopia	233	.015
10. Accommodation	389	.026
11. Angle of convergence	495	.033
12. Color vision	579	.038
13. Field of vision	10	.001
14. Refraction	428	.028
15. Ophthalmoscopic examination	21	.001
16. Head injury	58	.004
17. Hearing	48	.003
18. Neuromuscular equilibrium	28	.002
19. Height	113	.007
20. Weight	846	.056
21. Respiratory diseases	56	.004
22. Neurocirculatory instability	1,682	.111
23. Flying adaptability test	911	.060
24. Ears	39	.003
24. Nose	521	.034
24. Tonsillitis	480	.032
25. Dental defects	1,414	.094
26. Arteriosclerosis	--	--
27. Blood pressure	1,516	.100
28. Heart	129	.009
29. Genito-urinary system	35	.002
30. Skin	81	.005
31. Bones, muscles, and joints	35	.002
32,33. Miscellaneous	983	.065
34,36. All others	743	.049
37. Special	--	--
Total		15,104

Source: Annual Report of the Surgeon General (1940), 268.

Appointment, 1939

The files of those whose educational and physical qualifications had been approved by the flying cadet examining boards were sent to flying cadet headquarters in Washington for final approval, and those found qualified were placed on a waiting list of qualified candidates.

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This list was normally large and appointments were made according to a prescribed priority regardless of the date of examination. Candidates who had been on the eligible list for longer than six months were required to undergo another physical examination for flying before appointment could be authorized. When an applicant whose name was carried on the eligible list reached his twenty-seventh birthday, his name was automatically dropped from the list.<sup>40</sup>

The priority system in use for the selection of flying cadets in 1939 was as follows:

- a. (1) Graduates of the United States Military Academy, the United States Naval Academy, and the United States Coast Guard Academy who apply for appointment as flying cadets within 1 year from date of graduation, who fail to receive commissions because of lack of vacancies and are recommended for appointment as flying cadets by the respective superintendents of those academies.
- (2) Enlisted men of the Air Corps of the Regular Army who at time of appointment have served at least 11 months.
- b. Other enlisted men of the Regular Army who at time of appointment have served at least 11 months.
- c. Officers and enlisted men of the National Guard who at time of appointment have been assigned to Air Corps units for at least 11 months and who are favorably recommended by their commanding officers.
- d. College graduates who are graduates of Reserve Officers' Training Corps units of other arms or services.
- e. Graduates of recognized colleges and universities.
- f. Other officers and enlisted men of the National Guard who at time of appointment have had at least 11 months' service.
- g. Reserve officers and members of the Enlisted Reserve Corps who at time of appointment have served at least 11 months.
- h. Students in good standing of recognized universities, who have completed their sophomore year.
- i. Others.<sup>41</sup>

Classes were usually filled with candidates from the first five groups.<sup>42</sup> The average education of flying cadets in 1939 was three years of college.<sup>43</sup>

The flying cadet program for the fiscal year 1939 called for three classes. The authorized number of cadets for the year was 549, which meant that about 200 entered each class. For the March 1939 class there were approximately 800 men on the eligible list. As a result, the great majority of those appointed flying cadets were college graduates, two-year college men, or men with a record of military service.<sup>44</sup> Flying cadets were regarded by both the public and the Army as a highly selected group of individuals who were to be given a rare opportunity, namely, a chance to learn flying at the West Point of the Air, Randolph Field, Texas.

40. Flying Cadets of the Army Air Corps (1939).

41. Ibid.; AR 515-160, July 20, 1938.

42. Memo for Qualified Flying Cadet Candidates by Chief, Personnel Division, OCAC, May 20, 1930, in files of Aviation Cadet Branch.

43. Records of Aviation Cadet Branch.

44. Ibid.

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Chapter III

CHANGES IN THE SYSTEM OF SELECTION, 1939 - 1942

With the great acceleration of flying cadet training in 1939-1940, the existing system of selection was found to be too restricting. Instead of three classes of 200 each per year, a class was scheduled every five weeks, and during the fiscal year 1940, 3,709 men were assigned to training as against 903 in the preceding year. The once-long eligible list was exhausted in order to fill the July 1, 1939 quotas, and for many months thereafter it was a problem to get the necessary men to meet training quotas.<sup>1</sup>

There was some discussion of liberalizing the maximum age limit as a means of increasing the flow of flying cadet candidates. However, an age performance statistical study conducted by the Gulf Coast Air Corps Training Center in 1940 covering the cases of 7,784 flying students between the ages of twenty and twenty-eight years inclusive disclosed the following results:

<u>No. Considered</u>	<u>Age</u>	<u>Percentage Grad.</u>
204	20	61.27
766	21	58.62
1361	22	54.52
1478	23	52.17
1368	24	52.85
1117	25	42.17
819	26	40.29
497	27	41.05
174	28	33.33 <sup>2</sup>

It was apparent that any liberalization of the maximum age limit for flying cadets was unjustified.

A liberalization of the age limit not being feasible, other means had to be employed to secure candidates in the numbers desired. A relaxation of the physical standards was suggested, but the Medical Division, Air Corps, opposed such action. There was a relaxation, however, in the rigidity of interpretation of the existing standards by examiners. Waivers were granted in individual cases where circumstances seemed to warrant it.<sup>3</sup> Considerable work was done to reclaim rejected applicants where the disqualifying defects could be corrected.<sup>4</sup> A summary of the results of the physical examinations 1939-1943 are shown in Table VI. It will be noted that the percentage of those disqualified, in the case of both civilian and enlisted candidates, showed a constant downward trend throughout the period. For civilian applicants the disqualification rate dropped from 73.2 per cent in the calendar year 1939 to 50.3 per cent in the fiscal year 1941, then to 38.9 per cent in 1942, and to approximately 25.0 per cent<sup>5</sup> in 1943. For enlisted applicants the trend was similar; beginning with a disqualification rate of 54.2 per cent in the calendar year 1939, it dropped to 37.1 per

1. Records of Aviation Cadet Branch.
2. R&R, Chief, Training and Operations Division, OCAC, to Executive, OCAC, Oct. 5, 1940, in files of Aviation Cadet Branch.
3. Annual Report of the Office of the Air Surgeon (1942); R&R, Chief, Flying Cadet Section, Military Personnel Division, OCAC, to Medical Division, OCAC, May 13, 1941, in files of Aviation Cadet Branch.
4. Office of the Air Surgeon to Dr. Ludlow Stevens, Director, Department of Clinical Research, Philadelphia, Penna., Feb. 4, 1943, in AAG 741, Misc.
5. By 1943 the distinction between civilian and enlisted applicants had largely lost its significance, and the figures for fiscal year 1943 were not broken down.

cent in the fiscal year 1941, to 28.5 per cent in 1942, and to approximately 25 per cent<sup>6</sup> in 1943.

TABLE VI  
PHYSICAL EXAMINATIONS FOR FLYING, 1939 - 1943

	Qualified		Qualified with waiver	
	Civilian	Enlisted	Civilian	Enlisted
1939 <sup>1</sup>	2,792	138	101	1
1940	-	-	-	-
1941 <sup>2</sup>	21,623	3,954	467	35
1942 <sup>2</sup>	138,254	47,507	-	-
1943 <sup>3</sup>	316,051		-	-

	Disqualified				Total	
	Civilian	Per cent	Enlisted	Per cent	Civilian	Enlisted
1939 <sup>1</sup>	7,902	73.2	165	54.2	10,795	304
1940	-	-	-	-	-	-
1941 <sup>2</sup>	22,386	50.3	2,359	37.1	44,476	6,348
1942 <sup>2</sup>	53,834	38.9	13,546	28.5	192,088	61,053
1943 <sup>3</sup>	25.0%				316,051	

1. Calendar year
2. Fiscal year
3. Fiscal year; data incomplete; no breakdown as between civilian and enlisted shown; Statistical Division, Office of the Air Surgeon, estimates the number disqualified at 25 per cent on the basis of complete data received during the first six months.

Sources: Annual Report of the Surgeon General of the U. S. Army (1940, 1941); Annual Report of the Office of the Air Surgeon (1942, 1943).

While interpretation of the physical qualifications was being adapted to wartime needs, a similar adjustment was being made in respect to the educational requirements. In 1939 the examination was made somewhat less difficult; and in many sections of it objective-type questions were substituted for the old essay-type. Young men with less than two years of college training were encouraged to take the examination.<sup>7</sup> Boards of education, chapters of the American Legion, and other organizations in various parts of the country inaugurated courses for high school graduates to assist them in passing the mental examination required to qualify as flying cadets.<sup>8</sup>

A further impetus was given the flying cadet program when on July 2, 1940, Congressional legislation authorized the suspension during the fiscal year 1941 of all existing limitations on the number of flying cadets in the Air Corps.<sup>9</sup> The enactment into law of the Army Aviation Cadet Act on June 3, 1941, gave additional encouragement to aircrew procure-

6. Office of the Air Surgeon to Dr. Ludlow Stevens, Feb. 4, 1943, in AAG 741, Misc.; Annual Report of the Surgeon General (1940, 1941); Annual Report of the Office of the Air Surgeon (1942, 1943).
7. Questions for Educational Examinations for Appointment as Flying Cadets, Air Corps, 1921-1942, in files of Aviation Cadet Branch.
8. Memo for all District Recruiting Officers, etc., Second Corps Area by Second Corps Area Recruiting Officer, Oct. 14, 1940, in AAG 211 E, Cadets; memo for Chief, Personnel Division, OCAC, by Chief, Flying Cadet Section, Nov. 4, 1940, in files of Aviation Cadet Branch.
9. 54 Stat. 712.

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ment. The flying cadet now became an aviation cadet on an equal footing with aviation cadets of the Navy and Marine Corps who had been benefiting from certain pay and insurance privileges not enjoyed by the Air Corps flying cadets.<sup>10</sup>

Another important innovation in the summer of 1941 was the inauguration of aviation cadet training for qualified Negro applicants. Pilot training for colored candidates had been started late in 1940. First, the Civil Aeronautics Administration had begun preliminary development of Negro pilots at several educational institutions. The War Department had co-operated at the largest--that at Glenview, Illinois--by furnishing most of the equipment.<sup>11</sup> Then on July 19, 1941, the first class of qualified Negro aviation cadets entered training at Tuskegee, Alabama.<sup>12</sup> The quota at that time was ten every five weeks; by 1943 it had been raised to fifty-two per month.<sup>13</sup> The requirements for Negroes were the same as for white applicants, and the procedure for examination was the same, except that when decentralization of selection procedures was inaugurated following American entry into the war it did not apply to Negroes. Final approval and selection for assignment to school continued to be made by the Aviation Cadet Section, Military Personnel Division, Office, Chief of the Air Corps in Washington.<sup>14</sup>

Meanwhile, an increasing proportion of applicants, as well as a much larger total number, was meeting the educational requirements by passing the special educational test. It had become clear that the demand for aviation cadets could not be met by recruitment from college ranks alone, and, therefore, the educational standards had been gradually lowered so that more non-college men could qualify. Five times as many applicants took the test in the fiscal year 1941 as had taken it during the preceding nine years, and almost four times as many passed it as had qualified in this manner in the preceding nine-year period. In the first half of the fiscal year 1942, an additional 8,992 men took the educational examination. Of these, 5,562 or 61.9 per cent qualified. The marked increase in the number of men passing the tests reflected the lowering of standards due to a growing demand for manpower.<sup>15</sup>

Although educational standards were lowered, the nature of the examination underwent little change. The test remained a measure of the candidate's academic achievement. From 1938 on, the validity of such a test for selecting candidates for aircrew training was challenged on a number of occasions. In an ironic article a newspaper man wondered what bearing the battles of the Persians in 490 B.C. had on American preparation for war in 1940. A study of the Air Corps examination questions was begun with a view to designing a test which would measure the candidate's aptitude for flying training rather than his academic status.<sup>16</sup>

Until late in 1941 the educational examinations were constructed and graded at Randolph Field. As the number of applicants had increased, the volume of work involved in grading the essay or discussion type of examination had become a very real burden.<sup>17</sup> Hoping to

10. 55 Stat. 239.

11. Assistant Chief, Personnel Division, OCAC, to Charles Flowers, Lockland, Ohio, Nov. 13, 1940, in files of Aviation Cadet Branch.

12. 1st Indorsement (basic unknown), Aviation Cadet Section, MPD, OCAC, to President, Aviation Cadet Examining Board, Pope Field, Ft. Bragg, N. C., July 3, 1941, in *ibid.*; *cf.*, memo for Col. Streett, Office of the Assistant Secretary of War for Air, by Aviation Cadet Section, MPD, OCAC, June 10, 1941, in *ibid.*

13. Memo for Col. Streett by Aviation Cadet Section, MPD, OCAC, June 10, 1941, in files of Aviation Cadet Branch; memo for Chief, MPD by Chief, Aviation Cadet Section, Jan. 11, 1943, in *ibid.*

14. Memo for Chief, MPD by Chief, Aviation Cadet Section, Jan. 11, 1943, in *ibid.*; memo for Chief of Air Corps by AG, March 8, 1941, in *ibid.*

15. See Table III; "Report on Aviation Cadet Qualifying Examination," 4.

16. R&R, Executive, OCAC to Chief, Personnel Division, OCAC, Aug. 23, 1940, in AAG 352.12, Examinations; R&R, Chief, Personnel Division, OCAC, to Executive, OCAC, Aug. 26, 1940, in *ibid.*

17. Memo for Chief of Air Corps by Flying Cadet Examining Board, Randolph Field, Texas, Aug. 9, 1940, in *ibid.*

overcome this difficulty, the Air Corps had requested the Personnel Procedures Section of The Adjutant General's office to construct a set of objective examinations for use in initial selection.<sup>18</sup> The first objective-type educational examination was given during November 1941. Candidates were examined in five required subjects--English composition, arithmetic, geometry, trigonometry, and algebra--and from a list of five additional subjects--general history, United States history, physics, chemistry, or a foreign language--they were permitted to select any two options.<sup>19</sup> Men who could show college completion of any of the subjects could claim exemption and be given an arbitrary grade of 80 in that subject.<sup>20</sup> While the objective examination proved more reliable and required much less time to score than the older essay tests, it was not suited to the wartime needs of the Air Corps. It had been constructed to measure the level of education and training of applicants rather than aptitude for flying.<sup>21</sup>

As the aviation cadet training program had expanded, a number of new problems had arisen. It became clear that specialized training for the different aircrew positions was needed. In the summer of 1940, therefore, specialized navigator and bombardier training had been introduced. The first bombardier and navigator classes were composed of men selected from among cadets who had been eliminated from pilot training. Some men were sent to Florida for navigation training under the supervision of the Pan-American Airways instructors. Others were sent to Lowry Field for training as bombardiers.<sup>22</sup> In the first two years after these specialized schools were opened, the number of bombardiers and navigators graduated was as large as the total number of pilots graduated during the preceding sixteen years.<sup>23</sup>

Numerous changes in selection and training procedure followed the introduction of specialized aircrew training. At first the selection of men for bombardier and navigator schools was the responsibility of the Faculty Boards that eliminated men from pilot training. These boards made an effort to select men for navigation training who were well grounded in engineering and mathematics. It was also general practice not to recommend for navigation training any cadet who had been eliminated from pilot training for failure in ground school.<sup>24</sup>

The selection of bombardier and navigator students from lists of eliminated pilots was criticized by certain officers in charge of these types of training. It was asserted that this practice tended to place the importance of the bombardier and navigator below that of the pilot in the aircrew. It was also believed to have an adverse effect on morale in bombardier and navigator schools.<sup>25</sup> As a result, the policy was changed, and in October 1941 enlistment for bombardier and navigator training was placed upon the basis of education and aptitude.

18. Memo for AG by Assistant Chief MPD, May 9, 1941, in ibid.; memo for AG by Assistant Chief, MPD, May 27, 1941, in ibid.; memo for Executive, OCAC by Chief, MPD, May 29, 1941, in files of Aviation Cadet Branch; memo for AG by Executive, MPD, June 9, 1941, and following dates, in AAG 352.12, Examinations.
19. The August 1941 educational examination introduced these changes, but it was not a completely objective-type examination. Educational Examination for Aviation Cadet Appointment, Aug. 12, 1941, in files of Aviation Cadet Branch; "Cadet Mental Tests Undergoing Revision," in Air Corps News Letter, XXIV (Aug. 1941), 7.
20. OCAC Memorandum /n.d., approximately June 25, 1941, in files of Aviation Cadet Branch.
21. Memo for Chief of Air Corps by AG, Oct. 27, 1941, in AAG 352.12, Examinations; R&R, Aviation Cadet Section, MPD, to AC/AS, A-1, Nov. 28, 1941, in files of Aviation Cadet Branch; R&R, Chief of Air Staff to AC/AS, A-1, Nov. 15, 1941, in ibid.
22. "Report on the Aviation Cadet Qualifying Examination," 6; Executive, OCAC to AG, June 25, 1940, in AAG 211 E, Cadets; cf., memo for Chief of Staff by Chief of Air Corps, May 24, 1940, in AAG 353 C, Air Corps Training Directives and Program.
23. "Report on the Aviation Cadet Qualifying Examination," 6.
24. Assistant Chief of Air Corps to Commanding Generals, Training Centers, June 16, 1941, in AAG 353.9, Specialized Training.
25. Assistant Commanding Officer, Air Corps Technical School, Denver, Colo., to Chief of Air Corps, Oct. 3, 1940, in ibid., R&R, T&O to AC/AS, A-1, Aug. 26, 1941 and following dates, in ibid.

[REDACTED]

Those accepted for training were required to have a high school education and to make satisfactory scores on a battery of three aptitude tests. A physics test, the Army General Classification Test, and the Army Mechanical Aptitude Test were selected for use on the basis of research conducted by the Classification Section of the Technical Training Command with assistance from Personnel Procedures Section of The Adjutant General's office. Acceptance of the applicant was determined on the basis of the total score on the three tests.<sup>26</sup> A total of 1,507 applicants took these special aptitude tests prior to January 15, 1942, and 75 per cent were qualified for bombardier and navigator training.<sup>27</sup>

For the first time, young men who had not attended college were permitted to compete for appointment as aviation cadets on an equal basis with college men. This procedure for drawing cadets from a larger pool of manpower could not for long be limited to bombardiers and navigators. It was becoming apparent that there was not a sufficient number of college men to meet the increasing demand for pilots.

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26. R&R, Chief of Air Staff to Chief of Air Corps, Oct. 24, 1941, in ibid.; cf., Assistant Chief of Air Corps to Commanding Generals, Training Centers, Sept. 16, 1941, in ibid.
27. "Report on the Aviation Cadet Qualifying Examination," 7.

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Chapter IV

THE AVIATION CADET QUALIFYING EXAMINATION, 1942-1943

A series of conferences looking toward the development and refinement of a test to measure the aptitude and proficiency of the applicants for flying training, rather than their knowledge of formal educational matter, had been held during November 1941.<sup>1</sup> At their conclusion, representatives of the Military Personnel Division, Training and Operations Division, and the Medical Division, all of the Office, Chief of the Air Corps, had recommended that responsibility for such a test be assigned to the Psychological Research Agency in the Medical Division.<sup>2</sup> Official action on this recommendation had been taken by Brigadier General George E. Stratemeyer, then Assistant Chief of the Air Corps, who signed a directive on December 20, 1941, which established responsibility for aircrew selection and classification procedures.<sup>3</sup> An important reason for assigning responsibility in developing the qualifying examination to the Medical Division had been that a staff of individuals with professional training in the development and application of practical testing procedures had been built up in this office, and an extensive research program involving study of aircrew requirements and the development of aptitude tests for aircrew members had already been started.<sup>4</sup>

As early as June 14, 1941, the Chief of the Air Corps had approved a plan for the establishment of a Psychological Research Agency in the Medical Division, Office, Chief of Air Corps, to determine the characteristics necessary for success in pilot training schools, and to develop aptitude tests for measuring these characteristics.<sup>5</sup>

In order to facilitate this research, the Training Section of the Training and Operations Division had modified the program of instruction at Pilot Replacement Training Centers in the autumn of 1941 to include an allowance of six hours for psychological testing. The first Psychological Research Section had been established at Maxwell Field, Alabama, on September 22, and examination of the second class (42-E) to enter the Replacement Training Center was begun on October 11.<sup>6</sup> On December 18, 1941, the Medical Division had been made responsible for research on the selection and classification of bombardiers and navigators, in addition to research already in progress on pilots.<sup>7</sup>

In making plans for the original research program, it had been anticipated that a full year would be devoted to the accumulation of data, the tryout of preliminary tests, and analysis of results in relation to flying training records. The pressure of the emergency training program and American entry into the war made it necessary to proceed immediately with plans for the application of selection and classification tests which could sort out, from among hundreds of thousands of applicants, those possessing flying aptitudes, and then to divide this latter group into three sub-divisions containing those best fitted for pilot, navigator, and bombardier training. As early as August 20, 1941, a directive had been sent from the Chief of the

1. "Report on the Aviation Cadet Qualifying Examination," 8.

2. Annual Report of the Psychological Division, Office of the Air Surgeon (1942), 2.

3. Memo for Medical Division, Military Personnel Division, and Training Division, OCAC, by Assistant Chief of Air Corps, Dec. 20, 1941, in files of Aviation Cadet Branch.

4. "Report on the Aviation Cadet Qualifying Examination," 8; R&R, Aviation Cadet Section, MPD, to Medical Division, Aug. 29, 1941, in files of Aviation Cadet Branch; R&R, Medical Division to MPD, Aug. 29, 1941, in *ibid.*

5. Annual Report of the Psychological Division (1942), 1.

6. *Ibid.*, 2.

7. "Report on the Aviation Cadet Qualifying Examination," 9.

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Air Corps to the Military Personnel Division, directing that an intelligence examination be prepared for use in the selection of aviation cadets. This directive had been referred to the Medical Division.<sup>8</sup>

By the time that war was declared an outline for the Aviation Cadet Qualifying Examination, as the new test came to be called, had been developed and much work had been done on the construction of the first form of the test. In developing the outline and specifications for this test all available data on pilot selection were considered. Information from the last war and from research studies since that time was carefully studied and evaluated. The data secured by the National Research Council's Committee on Selection and Training of Aircraft Pilots, the results of recent studies conducted by the United States Navy, and the findings of the Technical Training Command were carefully examined and considered, together with the results obtained from the study of aviation cadets by the Psychological Research Units in the Air Force Replacement Training Centers.<sup>9</sup> Important consideration was also given to the suggestions and opinions offered by experienced flying officers who had been associated with the aviation cadet training program. Numerous conferences were held with officers within the Headquarters, Flying Training Command, and with flying instructors in order to secure information about the abilities that they considered necessary for aircrew members, and the aptitudes and proficiencies that they thought should be measured by the test.<sup>10</sup>

In addition, a detailed analysis was made of Faculty Board proceedings in cases of 1,000 aviation cadets who were eliminated from flying training schools in 1941. The board proceedings contained a summary of the reasons why each cadet failed. Analysis of these reasons furnished a cross section of instructors' opinions regarding the deficiencies of unsuccessful cadets and provided valuable information regarding selection.<sup>11</sup>

In summary, the outline and specifications for the initial form of the Qualifying Examination were based on the practical suggestions of flying officers, study of the reasons for elimination from training schools, and upon data from job analyses and special research studies. The specifications called for a test containing sections that would measure the following characteristics: comprehension and judgment, mathematical ability, mechanical comprehension, alertness, and leadership qualities. The final plans specified a test that could be administered by Examining Boards throughout the country to any applicant who desired to enlist as an aviation cadet.<sup>12</sup>

The original Aviation Cadet Qualifying Examination (Test AC-10-A) was completed by the Psychological Unit early in January 1942. Preceding its release, the examination was submitted for approval to a number of Army officers and to the Commands most directly concerned with the selection and training of aviation cadets. Final acceptance of the examination and approval of the procedures for its use were made by special board appointed by the Commanding General of the Army Air Forces. The board was composed of General Walter R. Weaver, General Ralph P. Cousins, Colonel Walter F. Kraus, and Colonel Luther S. Smith. On January 13 and 14 this board met with Colonel Harris Jones, United States Military Academy; Dr. Jerome Hunsaker, Massachusetts Institute of Technology; and Dr. Walter V. Bingham, Chief Psychologist, Personnel Procedures Section, The Adjutant General's office. The group considered the procedure for the appointment of aviation cadets and inspected Form AC-10-A of the Aviation Cadet Qualifying Examination. In its report the board declared, "These requirements, a major feature of which is the use of 'screening tests' in lieu of formal educational require-

8 Annual Report of the Psychological Division (1942), 3; Staff of the Psychological Branch, Office of the Air Surgeon, Hqs., Army Air Forces, "The Aviation Psychology Program of the Army Air Forces," in *Psychological Bulletin*, XL (1943), 759-761.

9 *Ibid.*, 9-10; "Test Ideas," a loose-leaf volume in the files of the Psychological Branch, Research Division, Office of the Air Surgeon, describes hundreds of test ideas gathered from a variety of sources.

10. "Report on the Aviation Cadet Qualifying Examination," 9.

11. *Ibid.*

12. Annual Report of the Psychological Division (1942), 9.

ments, are considered a distinctive step forward."<sup>13</sup>

Following the recommendation of this board, Test AC-10-A was officially put into use on January 15, 1942. All educational restrictions were removed and attainment of a passing score on the Qualifying Examination was established as the sole mental requirement for appointment as an aviation cadet.<sup>14</sup> About two hundred Aviation Cadet Examining Boards throughout the country began to administer the test to applicants. Examinations were held daily, or as often as circumstances warranted. Those who had failed the written educational examination on November 12, 1941, were notified that they were eligible to qualify under the revised educational requirements.<sup>15</sup> Under this new plan candidates failing in one examination were required to wait thirty days before taking a re-examination.<sup>16</sup>

Test AC-10-A was used for approximately two and one half months, after which it was replaced by Test AC-10-B. Other improved forms have been released periodically.<sup>17</sup> While the Aviation Cadet Qualifying Examination was not a speed test, a time limit of three hours was established. This limit gave the average candidate ample time to complete the test.<sup>18</sup>

The fundamental purpose of the Aviation Cadet Qualifying Examination was to qualify for aviation cadet training those men who were sufficiently alert and intelligent to be capable of learning an aircrew assignment and who could measure up to the intellectual and leadership standards required of officers in the Army. The test was designed to measure aptitude rather than specific technical information, formal educational achievement, or specialized training.

#### Analysis of Test AC-10-A

Various types of items were included to insure that individuals passing the test would possess those qualifications required for success in aircrew assignment. Test AC-10-A consisted of six main parts--Part I, Vocabulary; Part II, Reading Comprehension; Part III, Practical Judgment; Part IV, Mathematics; Part V, Alertness to Recent Developments; and Part VI, Mechanical Comprehension.

Each item in the vocabulary section (Part I) consisted of an incomplete sentence followed by five possible endings, one of which completed the sentence most satisfactorily. This section was designed to select men of good general intelligence who would be able to comprehend directions. Vocabulary tests were designed to predict the candidate's ability to understand and remember the sort of material that was covered in aircrew ground schools, where the student would be expected to remember what he read and heard. Sample items from the vocabulary section are shown below:

- 20. Pyrotechnic signals make use of
  - 20-A cannon.
  - 20-B depth charges.
  - 20-C Fireworks.
  - 20-D smoke columns.
  - 20-E radio.
- 25. Two circles which overlap but do not have the same center are
  - 25-A elliptical.
  - 25-B eccentric.
  - 25-C congruent.

13. Report of Special Board to Chief, AAF, Jan. 14, 1942, in AAG 211 E #2, Cadets.

14. Annual Report of the Psychological Division (1942), 3.

15. Assistant Chief, Aviation Cadet Section, MPD, to Commanding General, Fifth Corps Area, Jan. 15, 1942, in AAG 352.12, Examinations.

16. Assistant Chief, Aviation Cadet Section, MPD, to Librarian, Public Library, Cedar Rapids, Iowa, March 6, 1942, in *ibid.*

17. Annual Report of the Psychological Division (1942), 10.

18. AG to Commanding General, Second Corps Area, March 10, 1942, in files of Aviation Cadet Branch.

- 25-D unequal.  
25-E concentric.<sup>19</sup>

The reading comprehension section (Part II) consisted of reading passages of from 200 to 250 words each, and then answering several questions on each passage. Five choices were given from which each question was to be answered. The purpose of this section was to select individuals who could read and comprehend the sort of material which they would have to study and apply in aviation training. This section like that on vocabulary was a measure of general intellectual ability. An illustration from the reading comprehension section follows:

When a balloon rises through a layer of clouds and ascends into the sunshine above, the superheat generated by the sun's rays will cause the balloon to rise, unless its ascent is stopped by valving gas through the appendix. On descending, the descent may be made slowly until the clouds are reached, but as soon as the balloon enters the clouds and the sun becomes obscured, the gas contracts and increases the descending force. This descending force accumulates until counteracted by the discharging of ballast. If the balloon has descended through a layer of clouds and the earth is immediately below, a considerable amount of ballast must be discharged to compensate for loss of lift due to contraction of the gas. If the pilot waits too long before discharging ballast, the amount thrown is very much larger than if he checks his descent by discharging gradually as the gas contracts.

58. When a balloon is rising, the rate of ascent is usually checked by  
58-A increasing the amount of ballast.  
58-B allowing gas to escape through the appendix.  
58-C discharging ballast.  
58-D ascending into the clear sunshine above the clouds.  
58-E loss of momentum.
59. The most advisable procedure to follow in discharging ballast when descending through clouds is to discharge it  
59-A rapidly when entering the clouds.  
59-B gradually as gas is released from the appendix.  
59-C slowly as the balloon tends to gain momentum.  
59-D only during the last part of the descent.  
59-E immediately after the balloon emerges from the clouds.
60. The general effect of clouds on the flight of the balloon is to  
60-A make the ascent and descent more erratic.  
60-B slow the descent.  
60-C increase the speed of ascent through clouds.  
60-D make the ascent more steady or even.  
60-E produce little change in the flight of the balloon.<sup>20</sup>

The practical judgment section (Part III) contained items measuring judgment in practical situations. The items described a problem situation in a few brief sentences and offered five alternative procedures or solutions, one of which was the best answer. The problems favored the individual who had had a wide background of practical experience. Persons taking the test were not able to choose the best solution by applying any single rule, or by following any strictly logical or deductive reasoning process. The problems did not require specific information. Choice of the correct answer to each item required that the individual weigh the

19. Air Corps Qualifying Examination, Test AC-10-A (1942), 3; "Report on the Aviation Cadet Qualifying Examination," 10-11.  
20. Test AC-10-A 5; "Report on Aviation Cadet Qualifying Examination," 11.

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practical advantages and disadvantages of each procedure and select the most efficient solution from the five presented. The purpose of this section was to pick out individuals who were resourceful and who were able to "size up" a situation and exercise sound, independent judgment. It was designed to measure some of the requisite characteristics of men who were to be placed in positions of responsibility and leadership. An example from this section follows:

68. A solitary driver is on an urgent mission in a small scout car. In the car are an axe, a spade, a spare can of gasoline, and 10 feet of 1-inch rope. The driver comes to a big tree which has fallen down from a cliff and is lying directly across the road. The trunk of the tree is 4 feet in diameter and rests directly on the gravel roadbed. On one side is the cliff, on the other a river, so that the driver cannot drive around the fallen tree. In such circumstances his best procedure would be to
- 68-A chop out a section of the tree trunk and roll it aside.
  - 68-B ditch the road alongside the tree and roll the trunk into this ditch.
  - 68-C burn out a section of the tree trunk, using the gasoline.
  - 68-D tie the rope to one end of the tree and with the scout car pull the tree aside.
  - 68-E take a detour which will take one hour.<sup>21</sup>

The mathematics section (Part IV) contained items covering simple mathematics. Each item consisted of a mathematics problem and five choices, only one of which was the correct answer. The questions covered such topics as: (1) facility in handling numbers, figures, and quantitative relations; (2) knowledge of the mechanics of computation; (3) accuracy of computation; and (4) simple mathematical reasoning. The nature of the questions was such that they could be answered by capable individuals with as little as two and one half years of high school mathematics. This section was of special significance for selecting navigation students. However, it was designed to measure many of the skills and quantitative abilities that are required of other aircrew members. The section also contained problems requiring the ability to use and interpret data contained in graphs, tables, and charts. Illustrative examples are shown below:

82. If a motor makes 2000 revolutions per minute, the number of revolutions it can make in  $2/3$  of an hour is
- 82-A 3,000
  - 82-B 1,333  $1/3$ .
  - 82-C 90,000
  - 82-D 50.
  - 82-E 80,000
96. Two planes leave the same port at the same time, both flying in the same direction. If one travels 150 miles an hour and the other 250 miles an hour, in how many hours should the planes be 400 miles apart?
- 96-A 1.
  - 96-B 1  $3/5$ .
  - 96-C 5.
  - 96-D 2  $2/23$ .
  - 96-E 4.
99. Logarithms are the least useful in which one of the following processes?
- 99-A Subtraction.
  - 99-B Cube root.
  - 99-C Division.
  - 99-D Square root.
  - 99-E Multiplication.<sup>22</sup>

The "alertness to recent developments" section (Part V) contained items measuring information about late developments in the world. Items from each of the following fields were chosen: (1) aviation, (2) science, and (3) military affairs. Only happenings or facts that were of general significance and that had been given wide publicity were used, so that all persons

21. Test AC-10-A, 6; "Report on Aviation Cadet Qualifying Examination," 11.

22. Test AC-10-A, 8; "Report on Aviation Cadet Qualifying Examination," 12.

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who were alert and interested in these fields would have had an opportunity to acquire the information. This section of the test was designed to measure: (1) motivation and interest, as evidenced by the recall of important facts, events, and discoveries in fields in which aviation cadets ought to be interested; (2) general alertness to what was happening in the world; and (3) general level of information in fields other than those covered by formal study in school. Several illustrative items from this section follow:

110. Which one of the following planes used by the Royal Air Force is not American-made?
- 110-A Carlbon.
  - 110-B Lightning
  - 110-C Tomahawk.
  - 110-D Spitfire.
  - 110-E Mustang.
121. The chief reason for recent efforts to increase the use of plastics is to
- 121-A stimulate the chemical industry.
  - 121-B save materials needed for other purposes.
  - 121-C improve the durability of goods.
  - 121-D release workmen for defense projects.
  - 121-E reduce the manufacturing cost of certain articles.
129. After the German attack on Russia in June 1941, the United States
- 129-A avoided sending any direct aid to Russia.
  - 129-B announced that Lend-Lease aid would be sent to Russia.
  - 129-C stated that aid to Russia would depend on the Russian attitude toward the Church.
  - 129-D encouraged Finland to recover the territory she lost to Russia in 1940.
  - 129-E announced that aid to Britain prevented Lend-Lease aid to Russia.<sup>23</sup>

The mechanical comprehension section (Part VI) contained a number of diagrams, pictures, and perspective drawings. Each diagram was followed by an explanatory paragraph and several questions to determine whether or not the candidate taking the test comprehended the operation of the device, the principle involved in the drawing, and the explanation. The diagrams were largely self-explanatory, so that individuals with good aptitude but without training in mechanics or mechanical drawing and no experience with the devices portrayed could select the correct answers to the questions. All essential parts were labeled so that an individual unfamiliar with conventional drawing symbols could identify fixed and movable parts, bearings, and openings. This section was designed to measure the ability to comprehend spatial relations, the ability to understand mechanical movements, pressure relations, and the principles of operation of simple mechanical devices. It measured chiefly nonverbal ability and favored men with natural mechanical aptitude. On the following page is a sample item from this section:

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23. Test AC-10-A, 11-12; "Report on Aviation Cadet Qualifying Examination," 12.

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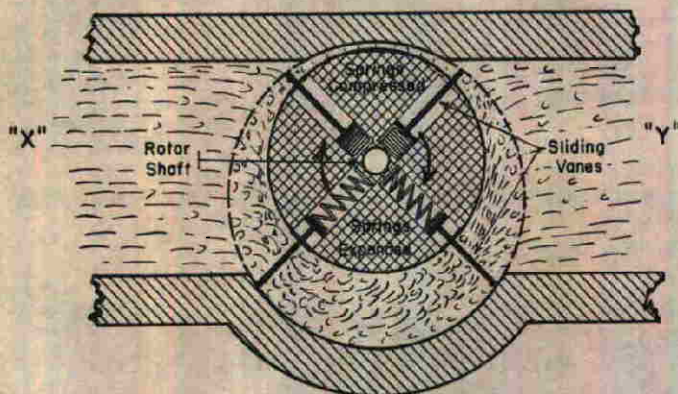


Fig. 1

**FUEL PUMP**

The most common engine driven fuel pumps used in airplane fuel systems are of the eccentric sliding-vane type of pump shown in Figure 1. When the pump rotor is turned the vanes move the fuel from the inlet to the outlet of the pump. Since the pump is symmetrical about a vertical axis, it will pump in either direction with equal efficiency. Reversing the direction of rotation has the same effect as changing the pump on the mount  $180^\circ$

136. As the pump in Figure 1 is rotated in a clockwise direction (as indicated by the arrows) it forces the fuel
- 136-A toward the opening at X.
  - 136-B toward the opening at Y.
  - 136-C toward opening X and Y in equal amounts.
  - 136-D toward the center of the rotor shaft.
  - 136-E around the axis of the pump in a continuous circuit.
137. If it is desired to increase the flow of fuel through this pump, the simplest procedure would be to
- 137-A shift the position of the vertical axis.
  - 137-B change the pump on the mount by exactly  $180^\circ$
  - 137-C increase the size of the inlet and outlet openings.
  - 137-D shorten the sliding vanes.
  - 137-E increase the speed of rotation of the vanes.
138. If one of the sliding vanes were to be removed and the slot in the shaft plugged up, rotation of the shaft would then
- 138-A move the fuel about the same as before.
  - 138-B pump no fuel at all.
  - 138-C force out fuel in an irregular or pulsating stream.
  - 138-D pump fuel in a direction the opposite of the former direction.
  - 138-E pump first in one direction, then in another.<sup>24</sup>

24. Test AC-10-A, 13; "Report on Aviation Cadet Qualifying Examination," 12.

## Standardization of Test AC-10-A

One of the advantages of an objective examination, such as the Aviation Cadet Qualifying Examination, was that it could be standardized on different populations or groups. Once this had been done, a number of accurate estimations could be made of the scores which other men would make on the test. The number of men from a given population who would make any given score could be predicted with considerable accuracy. After proper standardization of such a test, the passing mark could then be adjusted to admit any desired number of applicants; that is, the effect of changing the passing mark could be predicted.<sup>25</sup>

In order to collect data for such standardization purposes, Test AC-10-A was administered to several groups of men, including aviation cadets who had been selected for bombardier, navigator, or pilot training under the former two-year college requirement, enlisted men selected for pilot training by their officers, high school seniors, and West Point first classmen. The test was also administered to a number of men in selected colleges. In addition to data secured from these special studies, test scores were available on over 100,000 applicants who had taken Test AC-10-A at Aviation Cadet Examining Boards.

Early in January 1942 a group of 1,104 aviation cadets was given the trial edition of Test AC-10-A at the Air Forces Replacement Training Center, Maxwell Field, Alabama. This group contained 683 cadets who were scheduled to be trained as pilots, 221 who were to be trained as navigators, and 201 who were to be trained as bombardiers. All of these cadets were men who had met the two-year college requirement or had passed either the two-year college educational examination for pilot candidates or the special examination given applicants for bombardier and navigation training. In the group tested there were a few cadets who had been eliminated from pilot training schools and who had been accepted for training as bombardiers or navigators on the recommendation of Faculty Boards at the schools from which they were eliminated. The distribution of scores made by the total group of 1,104 cadets at Maxwell Field is shown in Figure 1.<sup>26</sup>

At the same time that aviation cadets were examined at Maxwell Field, 184 enlisted men who had been selected for pilot training as aviation students were given Test AC-10-A. The distribution of scores for this group is shown in Figure 2.<sup>27</sup> It will be noted that as a group the enlisted men made scores very much below those made by the aviation cadets. The results on 1,360 cadets and 286 students tested at Kelly Field were similar.<sup>28</sup>

After careful consideration of these data and estimation of the probable number and quality of future applicants, the passing mark on Test AC-10-A was set at a score of 90,<sup>29</sup> which merely meant that the candidate was required to answer correctly 90 out of a total of 150 items to qualify. It was believed that the passing mark of 90 would give fair assurance that the quality of men selected by the test would be as high as it was when men were selected on the basis of education, and that it would also insure a sufficient increase in the number of applicants qualified.<sup>30</sup>

The shaded areas of Figures 1 and 2 indicate the number of men who met the former requirements for aviation cadet training but who did not meet the passing mark of 90 on the Qualifying Examination. This amounted to 16.7 per cent of the aviation cadets and 50.5 per cent of the aviation students.<sup>31</sup> In spite of this striking difference between the two groups, however, the student pilots included enough men who made high aptitude scores to indicate that a large number of satisfactory applicants could be selected from the ranks of enlisted men in the Army.<sup>32</sup>

25. "Report on Aviation Cadet Qualifying Examination," 14.

26. *Ibid.*, 14-15.

27. *Ibid.*

28. *Ibid.*

29. The score was the number of rights plus one fifth of the omitted items.

30. "Report on the Aviation Cadet Qualifying Examination," 14.

31. *Ibid.*, 14-16.

32. *Ibid.*, 16.

32

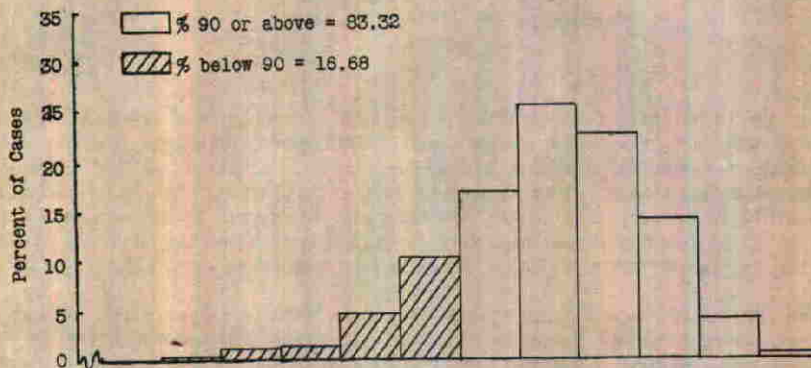


FIGURE 1

SCORES MADE ON TEST AC-10-A BY MEN ALREADY ENLISTED AS AVIATION CADETS  
FOR TRAINING AS PILOTS, BOMBARDIERS OR NAVIGATORS

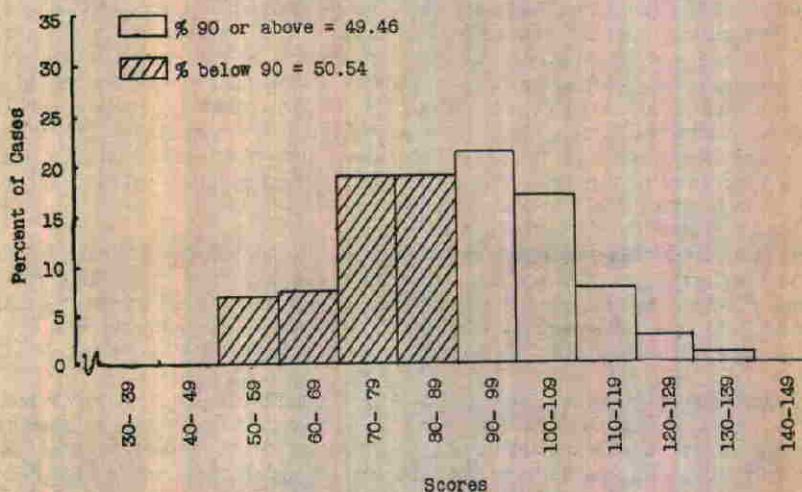


FIGURE 2

SCORES MADE ON TEST AC-10-A BY ENLISTED MEN ALREADY SELECTED  
FOR PILOT TRAINING

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 15.

The standards established by the Qualifying Examination, therefore, were such as to prevent the acceptance for training of even college trained aviation cadets who were as low in aptitude as the lowest groups in former classes. On the other hand, applicants were admitted under the new requirements who had not attended college and who lacked some of the specialized information and the social graces that were acquired during attendance at a college or university. In aptitude for flying, however, they ranked as high or higher than applicants admitted prior to January 15, 1942.<sup>33</sup>

33. ibid.

The distribution of scores made by first classmen at the United States Military Academy is shown in Figure 3.<sup>34</sup> The highest man made a score of 145 and the lowest a score of 105. No man failed the test. Some comparisons between these West Point cadets and other groups are of interest. The lowest West Point cadet made a score that was better than the scores of almost half of the aviation cadets, and better than scores made by 69 per cent of men applying for aviation cadet training during the winter of 1942. On the other hand, only about 2 per cent of the enlisted pilot students and 3 per cent of the high school boys made scores that equalled or surpassed the score of the average West Point cadet.

Data on a group of high school senior boys are given in Figure 4.<sup>35</sup> The significant fact to be noted from this figure is that approximately 40 per cent made scores of 90 or above. The test was administered at two fairly representative high schools. Assuming that the students tested in these schools were representative of high school students throughout the country, it may be said that the Aviation Cadet Qualifying Examination brought aircrew training within the reach of approximately 40 per cent of the high school seniors in the United States so far as the mental qualifications were concerned.

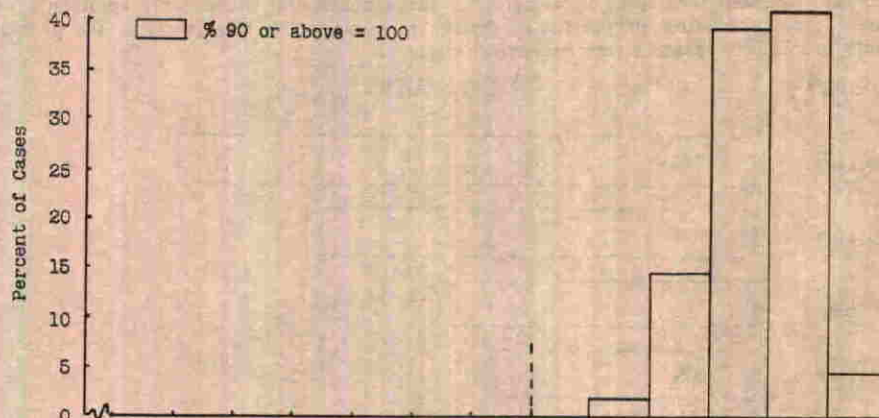


FIGURE 3

SCORES MADE ON TEST AC-10-A BY FIRST CLASSMEN AT THE UNITED STATES MILITARY ACADEMY

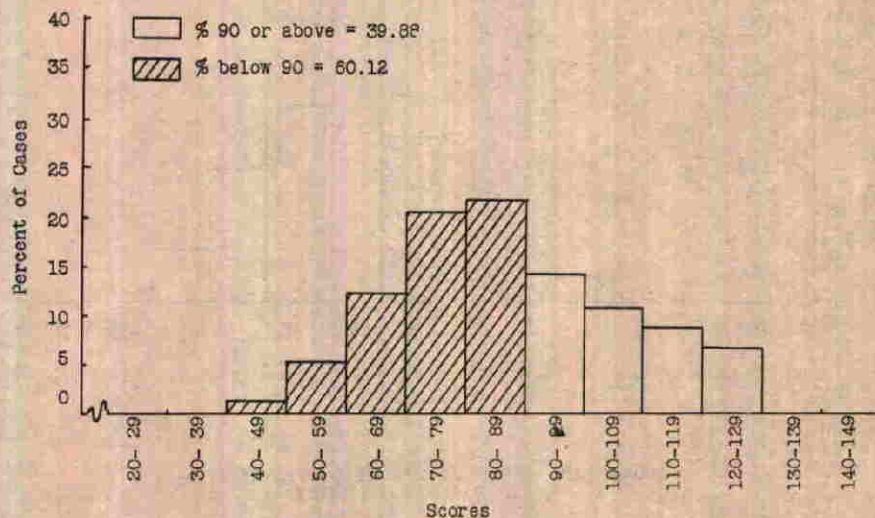


FIGURE 4

SCORES MADE ON TEST AC-10-A BY A REPRESENTATIVE GROUP OF HIGH SCHOOL SENIORS

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 17.

34. *Ibid.*, 16-17.

35. *Ibid.*

The Aviation Cadet Qualifying Examination <sup>36</sup> was also tried out in a number of colleges. In Figure 5 are shown the percentages of freshmen and sophomores who passed the test in four different colleges.<sup>37</sup> The marked difference that was found in the percentage passing in the four different colleges is striking. This is explained in terms of the nature of the schools. College A was a large, Class I institution, where entrance requirements were very high. Colleges B and C were typical state universities. College B had a large proportion of engineering students. College D had very low entrance requirements. The true figures representing the number of college freshmen or sophomores throughout the country who could qualify on the test would probably lie somewhere between the figures for Colleges B and C.

In Figure 6 is shown the distribution of scores made by a group of 1,000 men who were representative of those who applied for training during the first two months following release of the Aviation Cadet Qualifying Examination on January 15, 1942.<sup>38</sup> There is some evidence to indicate that the men who applied during these early months of war were better qualified and better educated than later applicants. A large number of these early applicants were college men. Since a smaller proportion of college men applied in later months, the percentage of applicants passing the examination decreased slightly.

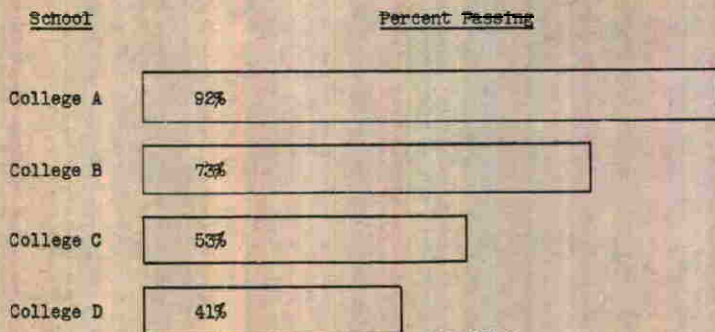


FIGURE 5  
PERCENT OF FRESHMEN AND SOPHOMORES  
IN FOUR DIFFERENT COLLEGES WHO PASSED TEST AC-10-A

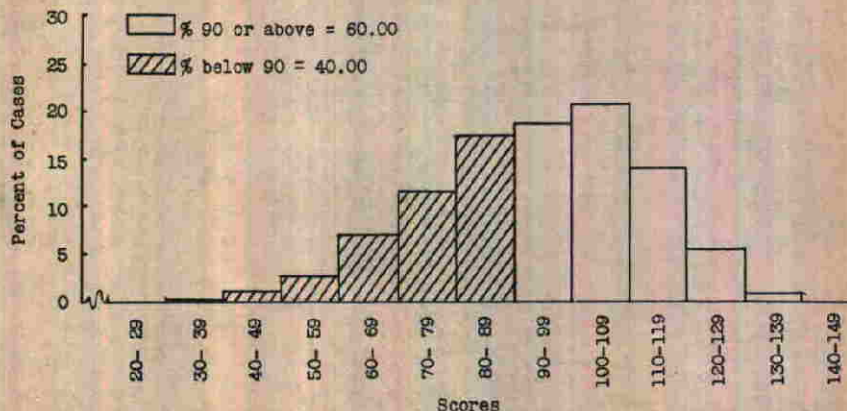


FIGURE 6  
SCORES MADE ON TEST AC-10-A BY A REPRESENTATIVE  
GROUP OF 1,000 APPLICANTS

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 19.

36. The test used in this case was Test AC-10-B, but the percentage passing on AC-10-A would have been quite similar since the former was equated with the latter.

37. "Report on the Aviation Cadet Qualifying Examination," 18-19.

38. Ibid.

It will be seen that 60 per cent of this group of 1,000 applicants passed the Qualifying Examination. This indicates that the men who were sufficiently interested in aircrew training actually to try to enlist were a superior group. On the average they made better test scores than boys in high school senior classes. They were also superior to the group of enlisted men who had been selected for pilot training. Their scores ranged from as low as 30 to above 140. About 1 per cent made a score higher than 130. The most frequent score was one between 100 and 109.<sup>39</sup>

Another way of evaluating the quality of applicants qualifying for aircrew training was to determine how high their scores were on some other test that had been standardized on a different population or group. The Army General Classification Test was given to a large number of cadets, and it was determined that a score of 119 in that test was equivalent to a passing mark of 90 on the Qualifying Examination. Although the two tests measured fairly different sets of abilities, it is reasonable to assume that since approximately one fourth of the men who are inducted into the Army obtain scores of 119 or higher on the General Classification Test, about an equal proportion could pass the Aviation Cadet Qualifying Examination.<sup>40</sup>

The relation of test score to education is a point of interest. The Aviation Cadet Qualifying Examination was developed to select men with aptitude for aircrew assignments regardless of the extent of their formal education or their mastery of school subjects. Yet it is believed that those who seek the best education tend to be the more able individuals, while those who drop out of school earliest tend to be individuals of lesser ability. Therefore, it was to be expected that college men would tend on the average to be more intelligent and to make higher scores on aptitude tests as well as on subject-matter tests than men who did not go to college. The uniformly high scores made at the United States Military Academy are a specific example of this correlation between educational level and test score.

Studies of the relation between education and score on the Qualifying Examination were reported by several of the Aviation Cadet Examining Boards. In Figure 7 are shown the results of examinations given to 1,670 men by the Philadelphia Aviation Cadet Examining Board during the period from January 15 to April 1, 1942.<sup>41</sup> The upper left-hand circle in Figure 7 represents the total number of men applying for examination. The different sectors of this circle represent the percentage of the total that is made up of (1) those men who had less than a high school education, (2) those with one year of college training, and (3) those with two or more years of college training. The circle on the right represents the men who successfully passed the Aviation Cadet Qualifying Examination. This circle is smaller because only 59 per cent of the applicants qualified. The sectors of this smaller circle indicate the educational level of the men who succeeded in qualifying. It can be seen that about 30 per cent of the applicants qualified for aviation cadet training by this board were men who had attended college. About two thirds of those qualified were men who had graduated from high school, while only 4 per cent had less than four years of high school training. The bars at the lower part of Figure 7 represent the percentage of men in each educational group who passed the examination. It will be noted that the percentage passing varied from 80 for college men to 20 for men with less than a high school education.

An interesting report on the Qualifying Examination made by one of the Examining Boards contained the following interpretations of the relation between education and test scores:

As might be expected, the average over-all grade made by the applicants taking this examination increases with the number of years of formal schooling which they have completed. . . . Practically all applicants with more than two (2) years of college training passed.

39. Ibid.

40. Ibid.

41. Ibid., 18, 20-21.

36

COMPARISON OF THE EDUCATION OF ALL APPLICANTS FOR AVIATION CADET TRAINING  
WITH THE EDUCATION OF MEN WHO PASS THE AVIATION CADET QUALIFYING EXAMINATION

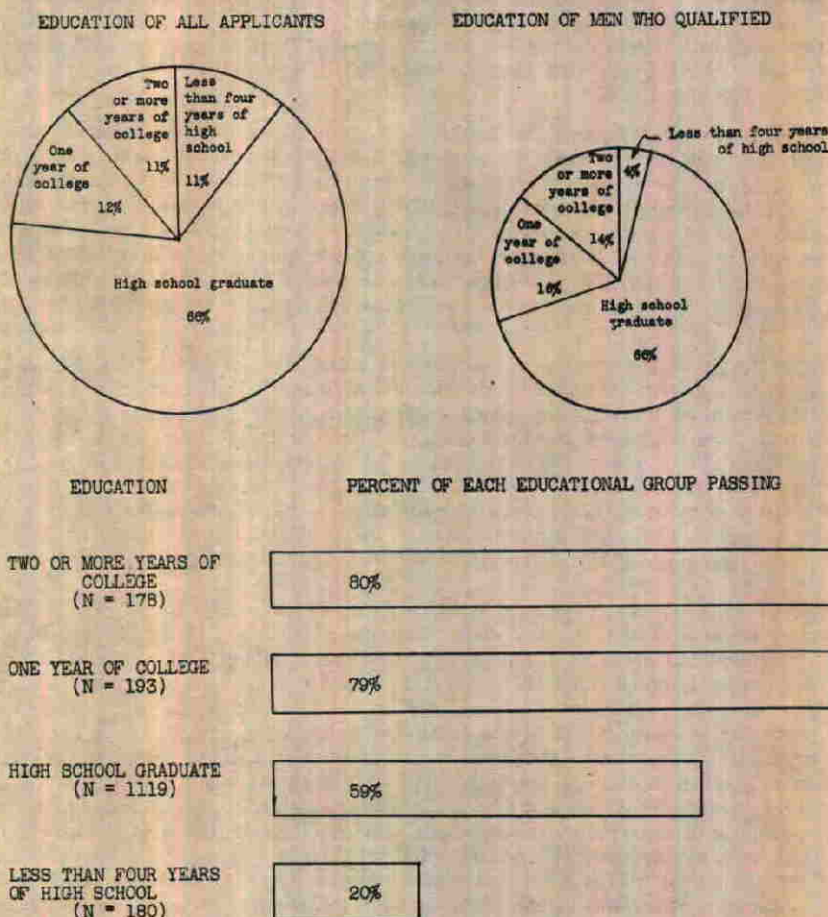


FIGURE 7

These data are based on all men who were given Test AC-10-A by the Philadelphia Aviation Cadet Examining Board from January 15, 1942 to March 1, 1942.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 21.

Perhaps the most interesting thing about the report is that we secured 179 qualified applicants out of the high-school group and an additional 73 out of the one-year college group, or a total of 252 which we would not have secured if the qualifications for appointment were still held at the two-year college requirement.

It is also interesting to note that 15 out of 107 men with two years of college or more were disqualified. It is perhaps safe to assume that these 15 men would not have been satisfactory as officer material inasmuch as they could not pass a relatively easy screening test.<sup>42</sup>

The reaction of this examining board is typical of that of other boards and of officers concerned with aviation cadet selection.<sup>43</sup>

42. Report of the Aviation Cadet Examining Board, San Francisco, Calif., to the Commanding General, West Coast Training Center, March 25, 1942, in IBID., 20.

43. "Report on the Aviation Cadet Qualifying Examination," 23.

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Success of Test AC-10-A in Predicting Eliminations  
from Aircrew Training

The final decision regarding the value of the Aviation Cadet Qualifying Examination, however, rests upon the degree to which it selects men who make successful pilots, bombardiers, and navigators. The degree to which AC-10-A selected men who were qualified for aircrew training is attested by the results that are presented below.

Before the first form of the Qualifying Examination was released for general use, the test was given to a large number of men (2,934 in all) who had already been selected for aircrew training. It should be emphasized that these men had already been assigned to specific types of training and that the scores that they made on the Qualifying Examination did not affect their classification in any way. The Qualifying Examination was given to these men while they were still in preflight school. Their records through specialized Air Forces schools were followed carefully. The number who successfully completed navigation school, bombardier school, or primary, basic, and advanced flying schools was determined. Records likewise were secured of the men who were eliminated from training. Only records of men eliminated for flying reasons, because of academic difficulty, or at their own request, were included. Men eliminated for physical reasons were not included.

Various statistical analyses were made in determining the validity of the total score on Test AC-10-A and the validity of the scores on each of its six component sections. One type of study was a comparison in the original tryout groups of the elimination rate for men who passed the test with that for men who failed the test. Scores on the total examination and scores for each part were broken up into different score levels, and comparisons were made between the scores made by men at these different levels and rate of elimination from training schools. Bi-serial coefficients of correlation were computed between part scores and success in training schools. The intercorrelations of the various sections of the test were computed and a multiple coefficient of correlation for predicting pilot success was determined. The reliability coefficients of the various sections of the test were computed. Item analyses were made to determine the validity of each item in the examination. Item analyses included the determination of the number of successful and of eliminated cadets who chose each one of the five choices to each individual item in the examination. It is interesting to examine some of the more significant results of these studies.<sup>44</sup>

The majority of the aviation cadets who were given Test AC-10-A for research purposes passed the examination--obtained a score of 90 or above. About half of the aviation students who were tested for research purposes passed the examination. As one indication of the practical value of the Aviation Cadet Qualifying Examination, a study was made of the elimination rate among men who passed and those who failed when it was given for research purposes. The results of this analysis are given in Table VII. It will be noted that 37.7 per cent of the aviation cadets who scored 90 or better on the test were eliminated from pilot training, whereas the elimination rate for cadets who scored below 90 was 57.8 per cent. For aviation students the comparable figures were 32.2 per cent and 55.2 per cent. The prediction of navigation school success was even more striking. Only 18 per cent of the cadets scoring 90 or above were eliminated while 52.4 per cent of the cadets who scored below 90 were eliminated. The test was less successful in predicting eliminations from bombardiering school. One reason for this lower validity for bombardiers may have been the fact that only a little over 9 per cent of the bombardier students were eliminated in the classes that were studied.<sup>45</sup>

44. Ibid.

45. Ibid., 23-25.

TABLE VII  
COMPARISON OF THE ELIMINATION RATE FOR  
MEN PASSING TEST AC-10-A WITH ELIMINATION  
RATE FOR MEN FAILING THE TEST

Air-crew Specialty	Score of 90 or Above (Passing)			Score of 89 or Below (Failing)		
	Total Number	Number Eliminated	Percent Eliminated	Total Number	Number Eliminated	Percent Eliminated
Pilots-Cadets	443	167	37.7	102	59	57.8
Pilots- Students	87	28	32.2	87	48	55.2
Pilots-Total	530	195	36.8	189	107	56.6
Navigators- Cadets	200	36	18.0	21	11	52.4
Bombardiers- Cadets	156	14	9.0	35	4	11.4

These data are based on the complete training records of Class 42-G for pilots, and Classes 42-6, 42-7, and 42-8 for navigators and bombardiers. These men were tested at Maxwell Field, Alabama, during the first part of January, 1942. All cadets and students already had been selected and classified for air-crew training. Test results were used for research purposes only.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 24.

In addition to the data included in Table VII, which are for men tested at Maxwell Field, data were assembled on 1,360 aviation cadets and 286 aviation students tested at Kelly Field. The elimination rates for Kelly Field aviation cadets who passed and failed the examination were 41.1 per cent and 60.4 per cent, respectively. The elimination rate for aviation students who passed the examination was 39.8 per cent, as compared with 56.3 per cent for students who failed the examination. The Kelly Field data were thus in close agreement with those obtained at Maxwell Field.<sup>46</sup>

A consideration of these data leads to the conclusion that the first form of the Qualifying Examination was a very useful test for selecting applicants for aviation cadet training. The results of preliminary research testing indicated that men who scored 90 or above on this examination had a much greater chance of graduating from training than did the men who scored 89 or below. Since these results were obtained on aviation cadets, all of whom were college men, and on aviation students, all of whom had been carefully selected for pilot training, it is safe to conclude that if the test could have been validated on an unselected group of students, it would have been found to be an even better selection device than is indicated by the above findings.

Studies were made also of the elimination rate in comparison with scores on the six parts of the Qualifying Examination. In order to simplify this analysis, scores on each part of the test are recorded as "A", "B", "C", "D", or "E". These scores are defined as follows:

46. Ibid.

- A - highest 7%  
 B - next highest 24%  
 C - middle 38%  
 D - next lowest 24%  
 E - lowest 7%

The percentage of eliminations for the group of men included in each one of these different grades is shown in Figures 8 to 13.47

The various parts of the examination were found to be of varying importance for predicting success in pilot, bombardier, and navigator schools. The relation between each of the parts and a particular aircrew specialty is shown below:

1. Mathematics: The mathematics part gave a very good prediction of success in navigation training. It was less accurate in predicting the success or failure of pilots and bombardiers. From Figure 8 it can be seen that well over 90 per cent of the aviation cadets who scored "A" or "B" on the mathematics part later graduated from training school, whereas less than 20 per cent of the cadets who scored "E" were graduated.

RELATION BETWEEN SCORE ON PART IV, MATHEMATICS  
 SECTION, TEST AC-10-A, AND ELIMINATION  
 RATE IN NAVIGATION TRAINING

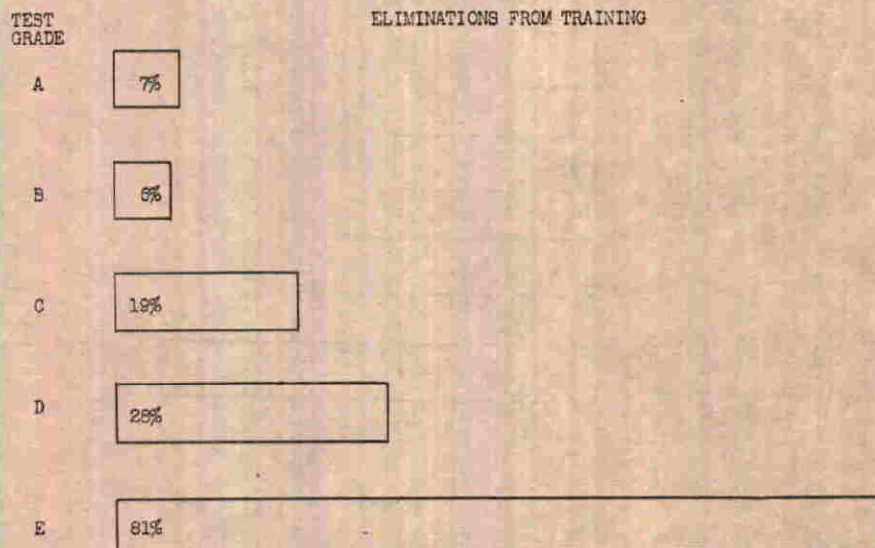


FIGURE 8

These data are based on 221 Navigators of Classes 42-6, 42-7, and 42-8, tested for research purposes at Maxwell Field, Alabama. The tests were given in January, 1942 before navigation training was begun, but the results were not used for classification.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 27.

40

2. Vocabulary: The vocabulary part was one of the more extensive sections of Test AC-10-A. Results showed that it was of special value only for the prediction of success in navigation school. The relation between the vocabulary score and navigation training is shown in Figure 9.

RELATION BETWEEN SCORE ON PART I, VOCABULARY  
SECTION, TEST AC-10-A, AND ELIMINATION  
RATE IN NAVIGATION TRAINING

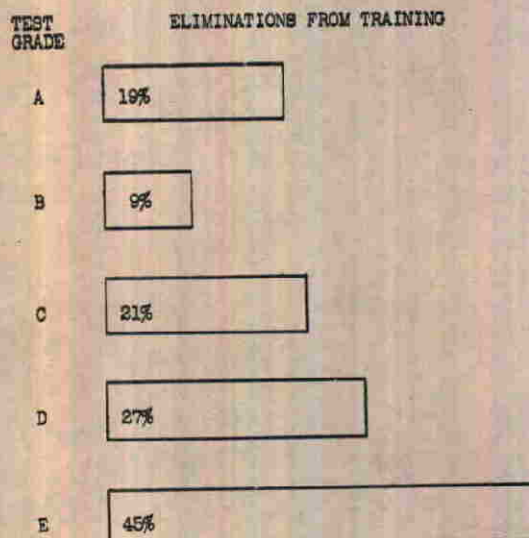


FIGURE 9

These data are based on 221 Navigators of Classes 42-6, 42-7, and 42-8, who were tested for research purposes at Maxwell Field, Alabama. The tests were given in January, 1942 before navigation training was begun, but the results were not used for classification.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 28.

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8. Reading Comprehension: This part showed a positive correlation with success in pilot training and a very high correlation with navigation training. In addition, it was the best part for predicting success in bombardiering. As shown in Figure 10, none of the aviation cadets who scored "A" on this section were eliminated from bombardiering training, while 25 percent of the cadets scoring "E" were eliminated. Since the elimination rate from bombardier school was only 9 per cent for all the cadets tested, this relationship may be considered as very satisfactory.

RELATION BETWEEN SCORE ON PART II, READING COMPREHENSION  
SECTION, TEST AC-10-A, AND ELIMINATION  
RATE IN BOMBARDIER TRAINING

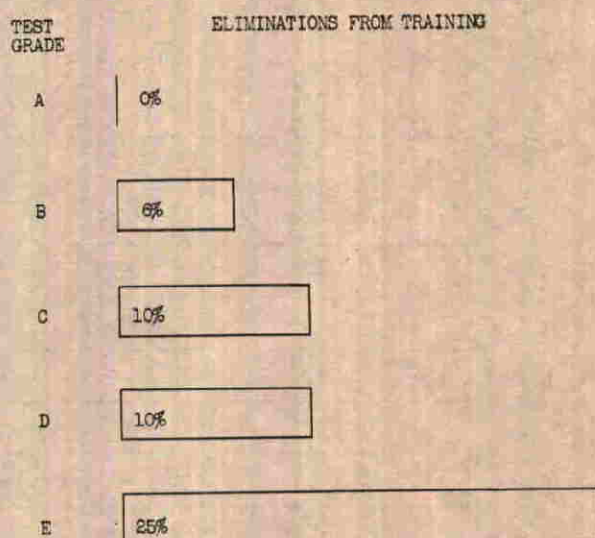


FIGURE 10

These data are based on 191 Bombardiers of Classes 42-6, 42-7, and 42-8 who were tested for research purposes at Maxwell Field, Alabama. The tests were given in January, 1942 before bombardier training was begun, but the results were not used for classification.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942). 29.

42

4. Knowledge of Recent Developments: This part was designed to measure interest. It was found that scores on this part predicted success in pilot training with a fair degree of success. This relationship is shown in Figure 11. A more detailed analysis of the specific questions in this part showed that knowledge of recent developments in the field of aviation was much more important in the selection of aviation cadets than a knowledge of recent developments in related fields.

RELATION BETWEEN SCORE ON PART V, KNOWLEDGE OF RECENT DEVELOPMENTS,  
TEST AC-10-A, AND ELIMINATION RATE IN PILOT TRAINING

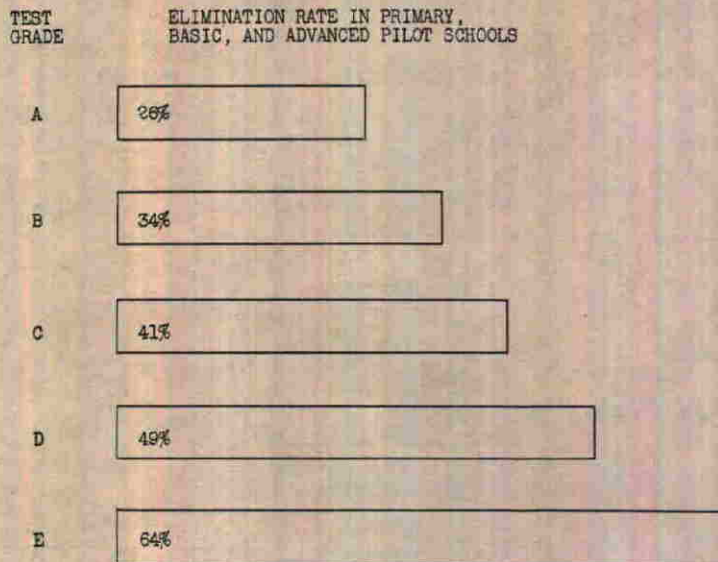


FIGURE 11

These data are based on 719 Pilots (Aviation Cadets and Aviation Students) of Class 42-G, who were tested for research purposes at Maxwell Field, Alabama. The tests were given in January, 1942 before flying training was begun, but the results were not used for classification.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 30.

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5. Judgment: The judgment part was found to be the best section for predicting pilot success. The results are shown in Figure 12. They indicate that if it were possible to assign for pilot training only men who scored "A" on judgment, and present standards were maintained, the elimination rate could be reduced to 18 per cent. On the other hand, if only men scoring "E" were assigned for pilot training, then the elimination rate would be 76 per cent. The judgment part was of special interest since it had a relatively low correlation with navigation training and a zero correlation with success in bombardiering. These findings indicated that the kind of judgment measured by this test was essential for success in pilot training but not for training for the other aircrew positions.

RELATION BETWEEN SCORE ON PART III, JUDGMENT SECTION,  
TEST AC-10-A, AND ELIMINATION RATE IN PILOT TRAINING

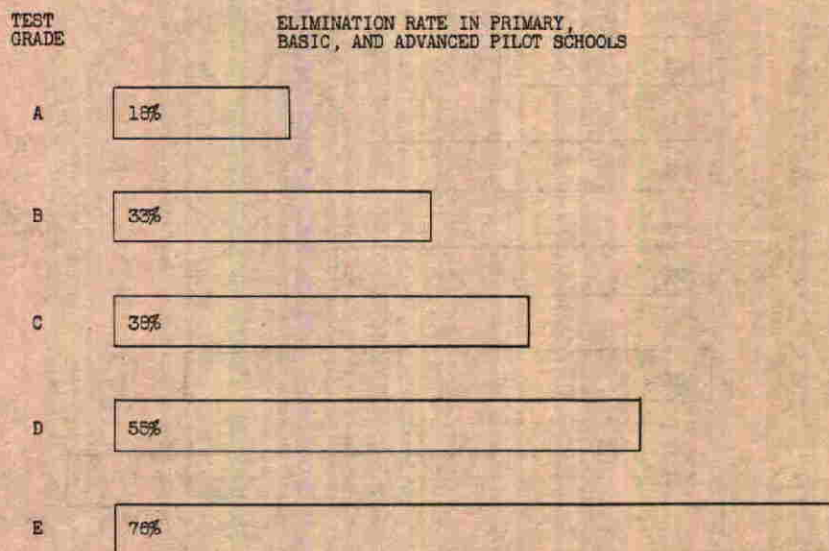


FIGURE 12

These data are based on 719 Pilots (Aviation Cadets and Aviation Students) of Class 42-G, who were tested for research purposes at Maxwell Field, Alabama. The tests were given in January, 1942 before flying training was begun, but the results were not used for classification.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 31.

44

6. Mechanical Comprehension: This part was highly useful in the selection of pilots. The degree to which it predicted pilot success is indicated in Figure 13. It selected pilots almost as well as the judgment part. The elimination rate for men who scored "E" was three times as great as for men who made a grade of "A". These results indicated that mechanical comprehension was one of the more important aptitudes required of the pilot. Scores on this part of the Qualifying Examination also correlated positively with success in navigation and in bombardiering.<sup>48</sup>

RELATION BETWEEN SCORE ON PART VI, MECHANICAL COMPREHENSION SECTION,  
TEST AC-10-A, AND ELIMINATION RATE IN PILOT TRAINING

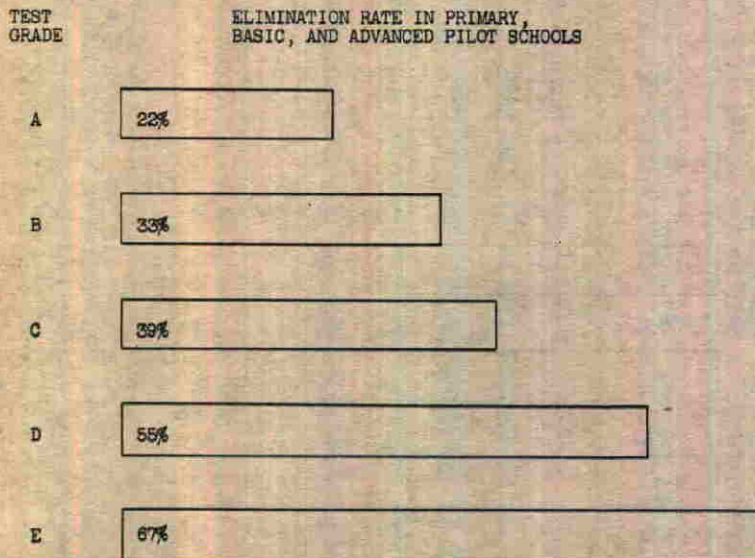


FIGURE 13

These data are based on 719 Pilots (Aviation Cadets and Aviation Students) of Class 42-G, who were tested for research purposes at Maxwell Field, Alabama. The tests were given in January, 1942 before flying training was begun, but the results were not used for classification.

Source: "Report on the Aviation Cadet Qualifying Examination" (October 1942), 32.

48. Ibid., 25-26.

Improvements in the Aviation Cadet Qualifying Examination  
Since Its Introduction

Statistical analyses carried out during 1942 furnished much vital information about the aptitudes required for success in the various aircrew assignments. Each part of the Qualifying Examination was studied exhaustively on the basis of all the research findings, and a large number of improvements were incorporated in later forms of the examination.

The policy followed by the Psychological Division was to apply its research findings to the development of each new form of the examination. Following the release of AC-10-A, forms AC-10-B, AC-10-C, AC-10-D, AC-10-E, AC-10-F, AC-10-G, and AC-10-H succeeded one another at intervals of about six weeks. The passing scores on these later forms were established by equating them with earlier forms. In general, it may be said that candidates were required to answer correctly between 55 and 60 per cent of the items given on the examination.<sup>49</sup>

A summary of the improvements that were to be found in forms AC-10-G and AC-10-H will show the general trend of the Aviation Cadet Qualifying Examination during the first eighteen months of its use.

Part I--Vocabulary. This section was greatly reduced in length, so that it made a much smaller contribution to the total score on the test. This was done because the part was found to contribute chiefly to the prediction of success in navigation training. The specifications for the section were also changed. In place of general words taken from Army Air Forces manuals, words related to practical mechanics or science were included. The test was set up to measure the sort of vocabulary that is most highly developed in men with special interests in aviation, mechanics, and related activities, and it was believed that this change would definitely improve its validity.

Part II--Reading Comprehension. The same sort of reading comprehension items that were included in the original examination were retained. The length of the section was doubled by the addition of items requiring the interpretation of data that were presented in maps, tables, graphs, and charts. The data that applicants were required to read and interpret were of the type that they would encounter if they were trained as aviation cadets. This type of material was included on the basis of research findings from the administration of tests of this type in Army Air Forces Classification Centers. Such test items had been found to correlate significantly with pilot success.

Part III--Judgment. This part was not modified. The same type of items that were found to be so satisfactory in Test AC-10-A were included in the new forms. An effort was also made to introduce aspects of practical judgment into other parts of the examination.

Part IV--Mathematics. The length of the mathematics part was reduced, since it was found to be less valuable for selecting pilots and bombardiers than other parts of the examination. The general types of items were the same as those that were included in earlier forms.

Part V--Knowledge of Recent Developments. The length of this part of the examination was increased. About half of the items were intended primarily to test the interests of pilots, and about one fourth of the items were intended to test the interests of bombardiers and navigators. The material covered in this part was restricted more closely to aviation developments since this type of item had been found to be most significant in predicting aircrew success. Interest in and information concerning certain recreational activities, such as sports, hobbies, and model airplane building, were included, since these activities had been found to be characteristic of successful aviators.

49. Records of Psychological Branch, Research Division, Office of the Air Surgeon; AG to Commanding General, First Corps Area (telegram), n.d., [March 1942].

**Part VI--Mechanical Comprehension.** The length of this part was increased. Some additional types of items designed to measure practical mechanical abilities were introduced. More diagrams and drawings were included, and less emphasis was placed on the interpretation of written descriptions for mechanical devices.<sup>50</sup>

In summary, it may be said that the changes in the six parts of the examination were such that there was much less emphasis than formerly on vocabulary or purely verbal ability, and somewhat less emphasis upon mathematics. Conversely, there was much more emphasis upon the ability to interpret data, interest in aviation, and mechanical insight. All of the changes were based on actual research findings and repeated validation studies.

#### Analysis of Test AC-12-I

The introduction of Form AC-12-I of the Aviation Cadet Qualifying Examination in July 1943 represented a decided departure from the earlier forms. The changes were designed to adapt the examination to the changing conditions of aviation cadet recruitment. By the summer of 1943 the Air Forces had largely exhausted their reservoir of college trained men. It was evident that an increasingly large percentage of aircrew candidates would have to be obtained from non-college sources and from the group under twenty years of age. AC-12-I was specifically designed for testing these groups. It demanded less educational background than was required by earlier forms of the test. The increased use of perceptual material in this examination was believed to provide a more accurate measure of aptitude for aviation cadet training, especially for the younger applicants, than some of the more formal material in the earlier forms of the examination.<sup>51</sup> Aviation Cadet Examining Boards were requested to invite all applicants whose scores on recent forms of the examination had not been more than ten points below passing to try the revised test.<sup>52</sup>

The new examination consisted of two separate booklets. The "First Booklet," which was divided into four parts, contained several types of perception tests which were also speed tests. Research had indicated that one of the qualities essential for success as a pilot, bombardier, or navigator was quick, accurate perception, and these tests were designed to measure this aptitude. The "Second Booklet," which was divided into three parts, contained materials similar to those which had been found in the earlier forms of the Qualifying Examination, and it was designed to test the applicant's judgment, mechanical comprehension, and interest in aviation. These tests were not speed tests, but for administrative reasons a time limit of two hours was imposed.<sup>53</sup>

A brief description of the seven parts follows. Part I was an Electrical Maze test, in which the candidate was to determine at which one of five places a single battery should be connected to operate a meter. Forty-five items were furnished the candidate, and he was given fifteen minutes in which to solve as many of them as possible. The directions given the candidate along with a sample item are shown on following page.

Part II was a Gottschaldt Hidden Figures test, in which the candidate was to determine which one of five simple outlines was contained in a complex figure. Forty-five items were furnished the candidate, and he was given fifteen minutes in which to solve as many of them as possible. The directions given the candidate along with a sample item are shown on page 48.

50. Aviation Cadet Qualifying Examination, Test AC-10-G (1942) *ibid.*, Test AC-10-H (1942)

51. *Ibid.*, Test AC-12-I, "First Booklet," "Second Booklet" (1943)

52. Memo for Commanding General, Army Service Forces by Executive, Office of the Air Surgeon, July 16, 1943, in AAG 702.5, Misc. Psychological Exams; Hq., Third Service Command, Procurement Memorandum No. 98, July 23, 1943, Aviation Cadet Branch files.

53. Memo for Commanding General, Third Service Command by AG, July 26, 1943, in files of Aviation Cadet Branch.

**Directions:** In this part you are to determine at which one of five places a single battery should be connected in order to operate a meter. In each of the circuit diagrams in this part, the box at the top is the meter.

The wires in the circuits shown in this part join one another only at the points indicated by heavy black dots. In Figure I at the right, wires a and b are joined at the point indicated by the heavy black dot. Wires a and c in Figure I also are joined and so make electrical contact.

Where two wires cross each other and no black dot appears, the wires are not joined at that point. In Figure II at the right, wires d, e, and f cross each other but no black dots appear. Therefore, wires d, e, and f do not join at the points where they cross.

Now look at sample item 00. From one of positions A, B, C, D, or E the wires lead to the meter, one wire leading to the left-hand side of the meter and the other leading to the right-hand side. This arrangement of wires will permit the meter to operate. You want to determine whether this arrangement starts at position A, B, C, D, or E. To do so, find the two wires leading from position A. These two wires meet above the letter A; the black dot shows that they join, so electric current could travel from one side of position A back to the other without ever getting to the meter. Therefore, position A cannot be the correct place to connect a battery to operate the meter.

Next, look at the two wires leading from position B. Both wires lead finally to the right-hand side of the meter. Thus position B cannot be the correct place to connect a battery to operate the meter.

Now look at the two wires leading from C. The left-hand wire leads to the right-hand side of the meter and the right-hand wire leads to the left-hand side of the meter.

The electric current can travel from one side of position C through the meter and back to the other side. So choice C is the correct answer to sample item 00 and the space under C in the sample answer spaces under Figure III has been blackened to show that this is the correct answer.

Neither position D nor position E can be correct because the right-hand side of position E and the left-hand side of position D are connected by a wire that leads nowhere else.

54. Test AC-12-I, 1.

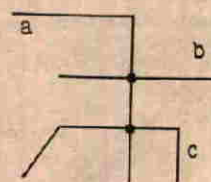


FIGURE I

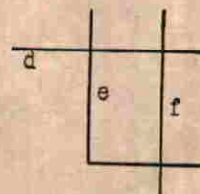


FIGURE II

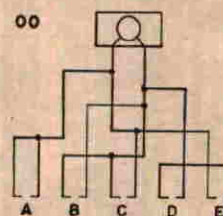
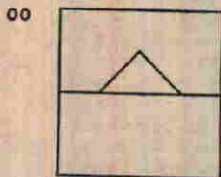
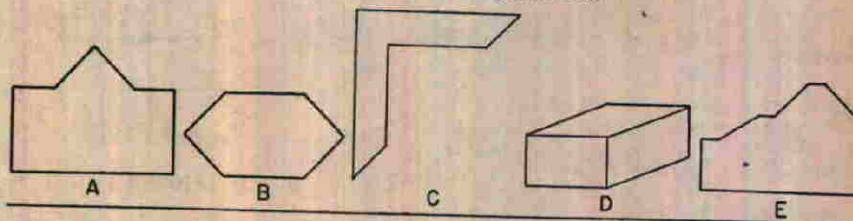


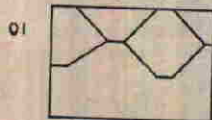
FIGURE III



Below are the five simple outlines followed by two sample exercises.



In sample 01, decide which one of the five simple outlines above is contained in the numbered figure.

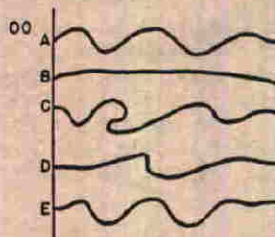


Outline E is contained in a portion of sample 01. Therefore space E has been blackened. 55  
55. Ibid., 9.

Part III was a Path Distance test, in which the candidate was to determine which was the shortest in a group of five irregular lines. Thirty items were furnished the candidate, and he was given two minutes in which to answer as many of them as possible. The directions given the candidate and a sample item are shown below:

**Directions:** This is a test of your ability to determine the *shortest* line in a group of five lines. You should look at each group of five lines as you come to it and decide which one of the five lettered lines is the *shortest*. Then on your separate answer sheet blacken the space corresponding to the letter of the *shortest* line.

Look at the following sample item.



SAMPLE ANSWER SHEET



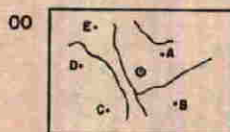
Notice that line B is clearly the shortest. Therefore, the space below the letter B has been blackened on the sample answer sheet at the right. <sup>56</sup>

56. *Ibid.*, 19.

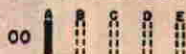
Part IV was a Point Distance test in which the candidate was to determine which one of five points was nearest a point ringed with a small circle, ⊙. Thirty items were furnished the candidate, and he was given two minutes in which to answer as many of them as possible. The directions given the candidate along with a sample item are shown below:

**Directions:** This is a test of your ability to determine which one of five points is *nearest* a point ringed with a small circle, ⊙. You should look at each group of five points as you come to it and decide which one of the five lettered points is *nearest* the point surrounded with the small circle. Then on your separate answer sheet blacken the space corresponding to the letter of the point *nearest* the point surrounded with a small circle.

Look at the following sample item:



SAMPLE ANSWER SHEET



Notice that in sample item 00 point A is clearly *nearest* to the circled point. Therefore, the space below the letter A has been blackened on the sample answer sheet at the right. <sup>57</sup>

57. *Ibid.*, 25.

Parts V, VI, and VII were tests of practical judgment, interest in aviation, and mechanical comprehension, respectively. The candidate was given two hours in which to work on them. Since tests of this type have already been described in detail in connection with the earlier forms of the qualifying examination, they will be given no further treatment here.<sup>58</sup>

Summary of Results of the Aviation Cadet Qualifying  
Examination

In summary, it may be said that each new form of the Aviation Cadet Qualifying Examination has been modified in the light of the latest research findings with a view to providing a more effective means of measuring flying aptitude and of adapting the examination more nearly to the changing conditions of aviation cadet recruitment. The increasing use of perceptual material, and the emphasis placed upon the candidate's ability to interpret data, his interest in aviation, and his mechanical aptitude are indicative of the changing concept of what qualities are essential for success in aircrew training. In time of war such factors as education and the social graces become secondary to the all-important question of whether the applicant can become a successful pilot, bombardier, or navigator. If he can, the Air Forces need him; if not, they cannot use him for aircrew training. The Aviation Cadet Qualifying Examination is helping hundreds of Aviation Cadet Examining Boards throughout the country to answer this question satisfactorily.

Table VIII shows the results of the Aviation Cadet Qualifying Examination during the last half of the fiscal year 1942 and during the fiscal year 1943. From January 15, 1942, to June 30, 1942, approximately 237,000 applicants took the Aviation Cadet Qualifying Examination and 51 per cent were successful in passing the test. During the fiscal year 1943 more than 431,000 applicants took the qualifying examination and 57 1/2 per cent of them passed the test.<sup>59</sup>

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58. *Ibid.*, "Second Booklet."

59. Records of Aviation Cadet Branch; Records of Psychological Branch, Research Division, Office of the Air Surgeon.

TABLE VIII

## RESULTS OF THE AVIATION CADET QUALIFYING EXAMINATION

<u>Month</u>	<u>Number taking examination</u>	<u>Number passing</u>	<u>Number failing</u>	<u>Per cent passing</u>
1942				
January	25,919	15,633	10,286	60
February	50,889	28,121	22,768	55
March	48,184	28,380	18,804	61
April	26,748	9,543	17,205	35*
May	45,510	22,566	22,944	49
June	39,160	19,624	19,536	50
July	41,349	19,481	21,868	46
August	59,630	27,623	32,007	46
September	53,901	26,186	27,715	48
October	70,073	33,920	36,153	48
November	61,198	36,113	25,085	59
December	41,355	25,398	15,957	61
1943				
January	17,874	10,854	7,020	60
February	21,814	13,658	8,156	62
March**	9,119	6,059	3,060	66
April**	13,428	9,160	4,268	68
May**	22,745	14,685	8,060	65
June**	19,161	12,146	7,015	63

\* Passing score on AC-10-B was set too high and had to be adjusted by lowering the passing score 10 points. This change was made retroactive and many of those who had originally failed were given a passing grade. This group is not reflected here and the corrected figure is not available, but the Psychological Branch, Research Division, Office of the Air Surgeon, estimated that the change altered the number passing by at least 10 per cent.

\*\* Data incomplete; however, samples are sufficiently large to furnish the basis for reasonably accurate percentages on those passing.

Sources: Records of the Aviation Cadet Branch, MPD, AC/AS, Personnel, Hq., AAF;  
Records of the Psychological Branch, Research Division, Office of the Air Surgeon, Hq., AAF.

[REDACTED]

Chapter V

OTHER SIGNIFICANT CHANGES IN INITIAL SELECTION  
PROCEDURES, 1941-1943

While the introduction of the Aviation Cadet Qualifying Examination was the most striking development in respect to the initial selection of aviation cadets in the period following American entry into the war, several other changes occurred which should be noted. In June 1941, as the entry of the United States into the armed conflict approached, there was added to the original requirement that the candidate be an American citizen, the stipulation that he must have been an American citizen for a period of at least ten years prior to the date of his application.<sup>1</sup> Waiver of this regulation was authorized where circumstances in the individual case warranted it.<sup>2</sup>

On December 13, 15, and 17, 1941, with Pearl Harbor still fresh in the minds of the American people, The Adjutant General sent radiograms to all the Service Commands directing that they open aircrew training to married men provided their dependents had sufficient means of support.<sup>3</sup> A short time later this restriction was removed and qualified married men were accepted for aircrew training on the same basis as unmarried men.<sup>4</sup> The Adjutant General also directed that final action on all qualifying examinations be taken by the Aviation Cadet Examining Boards, and applications were no longer to be sent to the headquarters office in Washington, except in the case of qualified Negro candidates and other special cases.<sup>5</sup> On January 5, 1942, the age limit for aviation cadets was lowered from twenty to eighteen years, thereby opening to the Air Corps an important new source of manpower.<sup>6</sup> Because of the acute shortage of medical examiners, Examining Boards were instructed to give the mental examination before the physical examination, thus reducing somewhat the flow of candidates through the flight surgeon's office.<sup>7</sup>

Physical standards were kept high in spite of much pressure to reduce them. The argument advanced by the Medical Division was that only men who would be physically fit for later combat duty should be trained. A limited teaching staff and training facilities, combined with the great cost of training aircrew members, were powerful arguments for the training of only the physically perfect. A few minor changes, such as the number of teeth and eliminations on the basis of old histories of diseases which had not been present for a number of years, were made,<sup>8</sup> but it was not until July 30, 1943, that any substantial relaxation was effected. At that time the physical requirements for flying were modified as follows:

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1. WD Circular No. 111, June 10, 1941, Sec. V.
  2. Instructions for Aviation Cadet Examining Boards. Requirements for Appointment as Aviation Cadet, Jan. 7, 1942; Aviation Cadet Examining Board, Grand Central Palace, New York City, to Aviation Cadet Branch, MPD, March 11, 1943, in files of Aviation Cadet Branch; Aviation Cadet Branch, MPD, to President, Aviation Cadet Examining Board, 166 Van Buren St., Chicago, Ill., June 2, 1943, in *ibid*.
  3. Aviation Cadet Section, MPD, OCAC, to President, Aviation Cadet Examining Board, Maxwell Field, Ala., Jan. 2, 1942, in *ibid*.
  4. Memo for Chief of Air Corps by General Cousins, AC/AS, A-1, Dec. 19, 1941, in AAG 211 E #2, Cadets.
  5. Aviation Cadet Section, MPD, OCAC, to President, Aviation Cadet Examining Board, Maxwell Field, Ala., Jan. 2, 1942, in files of Aviation Cadet Branch.
  6. WD Circular No. 3, Jan. 5, 1942, Sec. I.
  7. AG to Commanding Generals, Corps Areas, May 2, 1942, in files of Aviation Cadet Branch.
  8. Chief, Medical Division, OCAC, to Surgeon, Gulf Coast Training Center, Randolph Field, Texas, Dec. 31, 1941, in files of Professional Division, Office of the Air Surgeon; Instructions for Aviation Cadet Examining Boards, Jan. 7, 1942; Revised U. S. Army Air Force Aviation Cadet Program (effective April 4, 1942); Aviation Cadet Manual, Sept. 20, 1942.
- [REDACTED]

C4-5426, AF

a. Visual Acuity:

- (1) Distant Vision: Visual acuity of 20/30 correctible to 20/20 in each eye.
- (2) Near Vision: Jaeger test, type 1 at 13 inches with each eye.

b. Color Vision:

Correct interpretation of at least 75% of the test charts of either the American Optical Company or the 32-page Ishihara color vision test books.

c. Acuity of Hearing:

Acuity of hearing of 20/20 in one ear and 15/20 in the other to whispered voice.

d. Height and Weight:

Height will be from a minimum of 60 inches to a maximum of 76 inches. Weight will be from a minimum of 105 pounds to a maximum of 200 pounds, in accordance with the weight requirements of Paragraph 18, Section IV, AR 40-105, 14 October 1942, as amended. If the height of an applicant is below 64 inches and he is otherwise acceptable for aviation cadet training, he will be informed that his height precludes his classification for pilot training. In the physical examination of 17-year-old applicants, an allowance of 5 pounds below the minimum weight for individuals of the 18-20-year-old group will be made.

e. Blood Pressure:

The persistent systolic blood pressure will be no greater than 140 mm. and the persistent diastolic blood pressure will be no greater than 90 mm.

f. Dental Requirements:

Applicants will be free from gross dental defects and will have the minimum of an edentulous upper jaw and/or an edentulous lower jaw, correctible or corrected by a full denture or dentures.<sup>9</sup>

America's entry into the war also resulted in definite changes in the mechanics of procurement, selection, classification, and assignment. The preliminary work in connection with procurement was decentralized to the field, and the Service Commands were made responsible for the processing of applications; holding of examinations; qualification, except in special cases; enlistment; and assignment to training.<sup>10</sup> Chart 1 shows the way in which this decentralization speeded up and improved the processing of aviation cadets.<sup>11</sup>

With the development of an effective classification system, Aviation Cadet Examining Boards were ordered to stop the enlistment of candidates for specific training as pilots, bombardiers, and navigators; henceforth, all qualified candidates were to be enlisted merely for aircrew training in general. Decision as to the type of training was to be made at the Air Corps Replacement Training Centers after the administration of further physical and psychological tests.<sup>12</sup>

Assignment to an Air Corps Replacement Training Center was dependent upon quotas issued by the aviation cadet headquarters in Washington to The Adjutant General, who in turn allocated quotas to the several Service Commands.<sup>13</sup> The Service Commands then authorized

9. AG to Service Commands, July 30, 1943, in files of Aviation Cadet Branch.

10. Instructions for Aviation Cadet Examining Boards, Jan. 7, 1942; AG to Commanding Generals, Corps Areas, May 2, 1942, in files of Aviation Cadet Branch.

11. Memo for General H. A. Dargue by Maj. B. M. Giles, Executive, Inspection Division, OCAC, Jan. 8, 1941, in AAG 352.12, Examinations; Instructions for Aviation Cadet Examining Boards, Jan. 7, 1942.

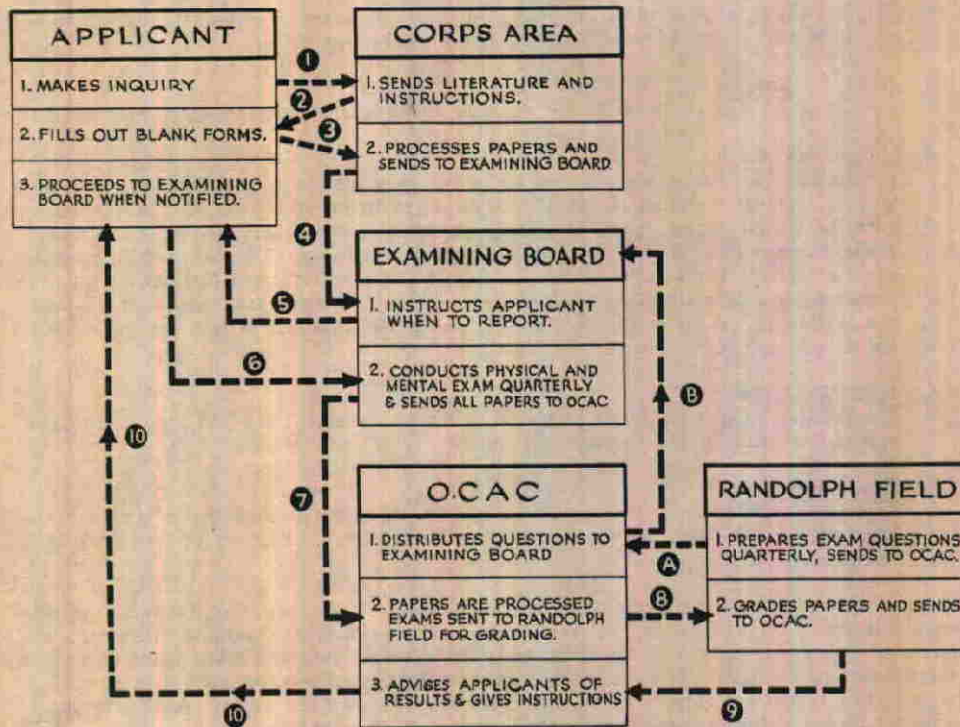
12. Memo for Chief of Air Corps by AC/AS, A-1, Dec. 19, 1941, in AAG 211 E #2, Cadets.

13. Ibid.

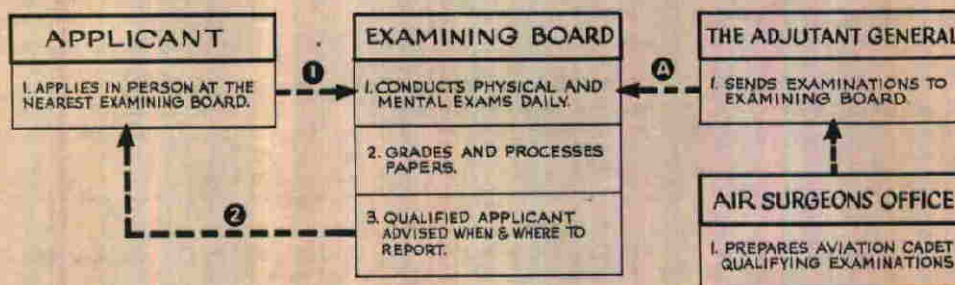
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## PROCESSING OF CADETS 1941-1942

## A. PROCEDURE IN JANUARY 1941 - BEFORE DECENTRALIZATION



## B. PROCEDURE IN JANUARY 1942 - AFTER DECENTRALIZATION



SOURCES: MEMORANDUM FOR GENERAL H.A. DARGUE FROM MAJOR B. M. GILES, A.C., EXECUTIVE INSPECTION DIVISION. JANUARY 8, 1941, IN AAG 352.12, EXAMINATIONS: INSTRUCTIONS FOR AVIATION CADET EXAMINING BOARDS, WAR DEPARTMENT, JANUARY 7, 1942.

C4-5426, AF

CHART 1

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the individual Aviation Cadet Examining Boards to enlist a certain number of candidates as privates in the Air Corps, after which they were appointed immediately as aviation cadets. In this way those who were found to be ineligible for flying training could be reduced from cadet to enlisted status rather than be discharged and returned to civilian life. The cadets were assigned to Air Corps Replacement Centers under instructions issued by the commanding generals of the Service Commands.<sup>14</sup> Chart II shows the flow of aviation cadet applicants into and through the Army Air Forces at the beginning of 1942.<sup>15</sup>

As the classification system for the selection of pilots, bombardiers, and navigators developed, and special Classification Centers for the processing of aviation cadets were established, it became increasingly evident that much time was being wasted and resentment and ill feeling were resulting from the practice of appointing qualified candidates as cadets before administering the battery of classification tests. Under such a system, many young men after being appointed aviation cadets found themselves eliminated from aircrew training as a result of their low scores on the classification tests. It was then necessary to find a place for them in some other type of Air Corps training, or to return them to the ranks as enlisted men. In the spring of 1943, therefore, it was decided to delay still further the appointment of aircrew candidates as aviation cadets until after they had passed their classification tests. Henceforth, aircrew candidates were enlisted as privates in the Air Corps and kept at that rank until the battery of classification tests had been completed. Only as they were assigned to pilot, bombardier, or navigator schools were they appointed as aviation cadets.<sup>16</sup>

Following the lowering of the educational qualifications for aviation cadet appointment and the exhaustion of the supply of college men, it became necessary to add an additional step to the selective process. In the spring of 1943 a college training program was introduced in an attempt to diminish individual differences in educational background and prepare the prospective aviation cadets for the technical instruction they would receive when and if they were found to be qualified for aircrew training. Under the new program the qualified applicant after a short period of about five weeks of basic training at a pre-aviation cadet training center was sent to one of 125 selected colleges or universities throughout the country which had been selected by the Army Air Forces to give this work.<sup>17</sup> Upon his arrival at the selected college, the candidate was given the Educational Classification Test, AC-20-A if he had not already taken it at the basic training center; then, from his scores on the different parts of the test and his educational history, it was determined what deficiencies existed, and the candidate was given a course of instruction which would correct these deficiencies.

The regularly scheduled college training program provided for approximately five months of schooling divided into twenty-one instructional weeks. In addition to the study of mathematics, geography, physics, civil air regulations, and military indoctrination, the aviation student might receive ten hours of flight training. Those failing in this work were, of course, eliminated from further consideration for aircrew training. The qualified candidates, upon completion of the college training course, were sent to one of the Army Air Forces Classification Centers where they were classified as pilots, bombardiers, or navigators.<sup>18</sup>

14. Instructions for Aviation Cadet Examining Boards, Jan. 7, 1942.

15. Ibid.

16. AG to Commanding General, AAF (Attention: Director of Personnel), Jan. 29, 1943, in AAG 221, Cadets; Director of Personnel, Hq., AAF, to AG, March 3, 1943, in files of Aviation Cadet Branch; WD, AGO Form No. 60 (Application for Appointment as Aviation Cadet), June 26, 1943.

17. Flying Training Command Memorandum No. 50-25-1, Feb. 24, 1943; 2nd Indorsement (basic unknown), Aviation Cadet Branch, MPD, to Commanding General, Ninth Service Command, April 7, 1943, in AAG 353, Aviation Cadet Training.

18. 2nd Indorsement, Aviation Cadet Branch, MPD, to Commanding General, Ninth Service Command, April 7, 1943, in AAG 353, Aviation Cadet Training; Aviation Cadet Training for the Army Air Forces (Pamphlet prepared by Recruiting Publicity Bureau, United States Army, June 3, 1943); memo for Col. Pearson, WD Liaison Officer, House of Representatives, by MPD, Hq., AAF, April 22, 1943, in AAG 353, Aviation Cadet Training; memo for Assistant Chief of Staff G-1 by Aviation Cadet Branch, MPD, June 9, 1943, in files of Aviation Cadet Branch.

CIVILIAN SOURCE MATERIAL  
AVIATION CADET APPLICANTS

### CHART II

C 4-5426, AF



The procedure just described, however, was not rigidly adhered to. Where a candidate's test scores were high and the quotas assigned to that pre-aviation cadet training center permitted, the candidate might be transferred directly to an Army Air Forces Classification Center.<sup>19</sup> Moreover, superior students might be transferred to a Classification Center after only a brief stay at college.<sup>20</sup>

Another interesting procedural change which was put into effect on August 1, 1943, provided that all men, both white and colored, processed at reception centers, who expressed a desire for flying training as aviation cadets (aircrew) and who met the following requirements, were to be assigned to Army Air Forces Basic Training Centers as part of the aviation cadet quotas allotted to the Army Air Forces:

- a. Age--18 to 26 inclusive.
- b. Citizenship--Native born citizens of the United States.
- c. Intelligence--Attains a score of 100 or above on Army General Classification Test.
- d. Physical qualifications--Apparently meets the general physical standards required of aviation cadets prescribed in Aviation Cadet Manual, 1942.

Final determinations of physical qualifications will be made at the Army Air Forces Basic Training Center to which applicants are assigned.

Each soldier was informed that this selection was tentative only; that before receiving training as a pilot, navigator, or bombardier, he would have to pass further physical, mental, and psychological tests; and that his assignment would also be dependent on existing training vacancies.<sup>21</sup>

This system had been in operation only a few weeks when it became evident that it was resulting in the inefficient utilization of manpower since approximately 46 per cent of the candidates being sent to the Army Air Forces Basic Training Centers were unable to pass the Aviation Cadet Qualifying Examination. To correct this situation The Adjutant General in October ordered the establishment of Aviation Cadet Examining Boards at each of the thirty-two reception centers to administer the Aviation Cadet Qualifying Examination to all enlisted men otherwise qualified, who applied for flight training. Only those enlisted men making passing grades on the Qualifying Examination were to be assigned to the Army Air Forces for aviation cadet training.<sup>22</sup>

Still another important procedural change was envisaged with the announcement in July 1943 that classification of aviation cadet candidates for the aircrew specialties of pilot, navigator, and bombardier was to be shifted from the three Classification Centers to the Army Air Forces Basic Training Centers so that candidates not qualified for aircrew training would be eliminated immediately. Under the new system, precious time and large sums of money would not be wasted giving college work to men who were not qualified for aircrew training.<sup>23</sup>

The various procedural changes just described also made necessary the adoption of new

19. 2nd Indorsement (letter from Aviation Cadet Examining Board, Miami Beach, Fla., to Fourth Service Command, March 6, 1943), Director of Personnel, to Commanding General, Fourth Service Command, March 13, 1943, in AAG 221, Cadets.
20. Flying Training Command Memorandum No. 50-25-1, Feb. 24, 1943.
21. AG to Commanding Generals, Service Commands, June 3, 1943, in AAG 221, Cadets.
22. Memo for Asst. Chief of Staff G-1 by Director, Military Personnel Division, General Staff Corps, Sept. 29, 1943 in AG 221, Aviation Cadets; AG to CG, Each Service Command, Oct. 6, 1943, in IBIA; Telegram, AGO to Commanding Generals, Service Commands, Oct. 14, 1943, in files of Aviation Cadet Branch.
23. Hq., AAF Technical Training Command to Commanding General, AAF, March 30, 1943, in AAG 220.01, Classification and Reclassification; Daily Diary, AAF Training Command, in files of Hq., AAF Training Command; conversation with Historical Officer, Aviation Cadet Branch.

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physical examination procedures. During the intensive recruiting drive in the colleges during 1942, it had been found necessary to change from the completed Form 64 examination to a modified Form 63 examination because of an insufficiency of flight surgeons and of special equipment. Enlistments were stopped by executive order on December 5, 1942, and no further examination of civilians was done until recruiting was reopened in March 1943. During this interim the pre-aviation cadet college training program had been inaugurated. Because of this additional five months of training before the administration of the classification tests and of the final type "64" physical examination by the Classification Centers, it was decided to return to the final type "64" physical examination during the initial qualification of applicants so that eliminations for physical reasons after the extensive college training would be reduced to a minimum.

With the announcement that the administration of the classification tests for selecting pilots, bombardiers, and navigators was being transferred from the special Classification Centers to Army Air Forces Basic Training Centers, it became advisable to make a further change in physical examination procedure. Under the new procedure, utilizing a modified Form 63 examination for civilians, and a certificate for soldiers, all the medical facilities of the Army were made available for the examination of aviation cadet candidates, and a serious bottleneck in qualifying applicants was broken.<sup>24</sup>

From crude beginnings there has emerged a system for selecting aircrew candidates which, although far from perfect, rests upon a reasonably sound scientific basis and is producing satisfactory results. Prior to 1939 when only a few hundred men were needed to fill cadet quotas, qualifications were set at such a high level that a process of natural selection was operative. The men who survived the rigid mental and physical examinations were a superior group. With the inauguration in 1939 of the Air Corps expansion program requiring thousands of men, the old system of natural selection was no longer sound. In order to meet aircrew quotas the best possible use had to be made of the available manpower pool. Physical, mental, psychological, and psychiatric tests were designed with a view to measuring the degree of flying aptitude of the individual candidates and of eliminating those who were regarded as unfit for aircrew training.

Selection practices today represent no radical departures from those employed in the twenties and thirties. They are rather the result of evolutionary processes. The Aviation Cadet Qualifying Examination now in use is simply an adaptation of earlier educational and psychological tests to the selection for aircrew training of candidates with flying aptitude. The Qualifying Examination is the work of no one man, nor of any one period. Its roots go back to the first World War, while recent changes are based on the latest research findings. Instead of attempting to measure purely verbal ability and mathematical aptitude, later forms of the Qualifying Examination emphasize the ability to interpret data, interest in aviation, and mechanical aptitude, since these qualities have been found to be more closely related to ability to fly than formal academic standards. The comprehensive physical examination in use today rests firmly upon foundations laid during the first World War. New apparatus has been devised and various modifications of the physical qualifications have been made from time to time so as to adapt the system more effectively to the selection of candidates physically qualified for flying, but they merely represent logical steps in a gradual evolutionary process.

The selection of candidates for aircrew training has been conditioned to a marked extent by the fundamental law of supply and demand. In the twenties and thirties when the number of applicants for training far exceeded Air Corps training quotas, both physical and educational qualifications were high and their application was strict. Following the inauguration of the expansion program in 1939 the Air Corps was faced with a very different situation. The number of applicants for aircrew training was insufficient to meet Air Corps training quotas. Procurement campaigns were instituted, and a relaxation in the interpretation of both physical and educational qualifications followed. Ultimately, the standards themselves were lowered, but in such a way as not to affect vitally the quality of aircrew personnel. While candidates are no

24. Historical Report, Aviation Cadet Branch, Week Ending Sept. 11, 1943, in files of Historical Division, AC/AS, Intelligence.

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longer required to have completed two years of college training, they must show a satisfactory degree of flying aptitude by passing the Aviation Cadet Qualifying Examination. It is obvious that the aviation cadets of 1943 do not have the academic background of the cadets of 1941, but it is the contention of those responsible for the introduction and maintenance of the Aviation Cadet Qualifying Examination that successful candidates in 1943 are the equal of earlier groups insofar as flying aptitude and intellectual comprehension are concerned. The relaxation of physical requirements to admit candidates who are not physically perfect was also done in such a way as not to affect materially aircrew efficiency.

The key to aviation selection procedures from the first World War down through 1943 is the attempt to maintain a proper balance between the supply of and the demand for suitable aircrew personnel. When conditions warranted, standards were rigidly maintained at a high level and selection procedures were centralized. As circumstances changed, standards were modified in the light of current needs and procedures were decentralized. Through the application of such a flexible policy Army Air Forces' needs have always been met and satisfactory personnel has been supplied for aircrew training.

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## GLOSSARY

AAF	Army Air Forces
AAG	Air Adjutant General
AC/AS	Assistant Chief of Air Staff
AG	Adjutant General
AGO	Adjutant General's Office
AR	Army Regulations
ARMA	Adaptability Rating for Military Aeronautics
<u>Cl.</u>	Compare
Hq.	Headquarters
<u>Ibid.</u>	The same <u>or</u> the same place
MPD	Military Personnel Division
OCAC	Office Chief of Air Corps
RMA	Reserve Military Aviator
R&R	Routing and Record Sheet
SAM	School of Aviation Medicine
T&O	Training and Operations
TM	Technical Manual
WD	War Department

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